
PATIENT MONITOR
PM 6500

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MANUAL BOOK

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Responsibility on the manufacturer party

Our company is responsible for safety, reliability and performance of this equipment only in the conditions that:

- All installation, expansion, change, modification and repair of this equipment are conducted by SINKO qualified personnel; and,
- Applied electrical appliance is in compliance with relevant National Standards; and,
- The monitor is operated under strict observance of this manual.

WARNING

- **This monitor is not a device for treatment purpose.**
-

NOTE:

- **This equipment is not intended for family usage.**

It is important for the hospital or organization that employs this equipment to carry out a reasonable maintenance schedule. Neglect of this may result in machine breakdown or injury of human health.

Upon request, SINKO may provide, with compensation, necessary circuit diagrams, calibration illustration list and other information to help qualified technician to maintain and repair some parts, which our company may define as user serviceable.

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Warranty

Workmanship & Materials

SINKO guarantees new equipment other than accessories to be free from defects in workmanship and materials for a period of 12 months (six months for multi-site probes and SpO₂ sensor) from date of shipment under normal use and service. SINKO's obligation under this warranty is limited to repairing only.

Exemptions

Our company's obligation or liability under this warranty does not include any transportation or other charges or liability for direct, indirect or consequential damages or delay resulting from the improper use or application of parts or accessories of the product or the substitution upon it not approved by us or repaired by anyone other than SINKO authorized personal. This warranty shall not extend to any instrument which has been subjected to abnormal use, maintenance negligence or damaged; any instrument from which our company's original serial number tag or product identification markings have been altered or removed, or any product of any other manufacturer.

Safety, Reliability and Performance

Our company is not responsible for the effects on safety, reliability and performance of the Monitor if:

- The components are disassembled, stretched or re-adjusted.
- The Monitor is not used in accordance with the instructions for use, or the electrical installation of the relevant room does not comply with NFPA 70: National Electrical Code or NFPA 99: Standard for Health Care Facilities (Outside the United States, the relevant room must comply with all electrical installation regulations mandated by the local and regional bodies of government).

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Return Policy

Return Procedure

In the event that it becomes necessary to return a unit to our company, the following procedure should be followed:

- Obtain return authorization. Contact our Service Department and tell us the product serial number. The number is marked on the outside of the shipping package. Return shipments would not be accepted if the number is not clearly visible. Please provide the model number, serial number, and a brief description of the reason for return.
- Freight policy. The customer is responsible for freight charges when equipment is shipped to our company for service (this includes customs charges).

Preface

This manual gives detailed description to the Monitor concerning its performance, operation, and other safety information. Please read the user manual carefully before use in order to operate this product correctly and guarantee the safety of patient and operator.

Keep the user manual near the product for convenient and timely accessed when needed.

Following symbols represent some important facts that you have to pay special attention to:

Safety warnings indicate the severity of potential hazards.

Warning: prompting potential dangerous or unsafe operations, if not avoided, it may result in death or severe personal injury or property damage.

Caution: prompting potential dangerous or unsafe operations, if not avoided, it may result in slight personal injury, product failure or damage, or property damage.

Note: emphasizing important attentions, providing explanations or interpretations for better use.

NOTE:

- The user manual contains descriptions concerning all configurations, so part of the content may not suitable for the product your purchased. If you have any doubts, please contact with us.
- Refer to the device for its date of manufacture and service life.

This manual is intended for persons who are familiar with the functioning measurements and have experience in operating the monitoring equipment.

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Chapter 1 Safety

1.1 Safety Information

WARNING

- Before using the device, the equipment, patient cable and electrodes etc. should be checked. Replacement should be taken if there is any evident defect or signs of aging which may impair the safety or performance.
 - The Monitor is intended for clinical monitoring application with operation only granted to appropriate medical staff.
 - The monitor can be used on only one patient at a time.
 - **EXPLOSION HAZARD**-Do not use the device in a flammable atmosphere where concentrations of flammable anesthetics or other materials may occur.
 - There could be hazard of electrical shock by opening the monitor casing. All servicing and future upgrading to this equipment must be carried out by personnel trained and authorized by our company.
 - To prevent delayed treatment, sufficient alarm setup should be done according to individual patient situation and make sure that alarm sound can be activated when alarm occurs.
 - Do not touch the patient, table, or the device during defibrillation.
 - The device is available to connecting with the patient who using cardiac pacemaker or other electrical stimulation devices, but this may result in risks.
 - When used with Electro-surgery equipment, the operator (doctor or nurse) must give top priority to the patient safety.
 - The monitor and devices connected to it shall form an equipotential system (protective earth).
 - If the protective earth system is unstable, the monitor should apply internal power supply.
 - This device can only be connected to a power socket with protective earth. If the power socket is not grounded, do not use the socket and the monitor should be power supplied by rechargeable batteries. Do not connect the three-wire cable to a second-wire plug.
 - The information of physiological waveform, physiological parameters and alarm, etc., shown on the monitor is for medical reference only, it can't be regarded as the basis for clinical treatment directly.
 - Be careful to place the power cord and various cables of accessories to avoid the patient being wound or suffocated, or the cable entangled together, or subject to electrical interference.
 - The disposal of packaging materials should obey the local regulations or the hospital waste disposal system. The packaging material must be keep out of the reach of children.
 - Do not modify the monitor and its accessories without SINKO's authorization. Doing so might caused danger, disrupts electrical safety measures, monitor malfunction, or change in device performance that may harm patient's and/or operator's life.
-

CAUTION

- The monitor's service life is 5 years. At the end of its service life, the product described in this manual, as well as its accessories, must be disposed in compliance with related local regulations or hospital regulations.

If you have questions concerning disposal of the product, please contact our company or representative institution.

- When you have questions about the integrity of the external grounding of the monitor and its arrangement, the internal battery must be used for operation.
 - Electromagnetic fields can affect the performance of the monitor, so other equipment used near the monitor must meet the appropriate EMC requirements. Mobile phones, X-rays, or MRI devices are possible sources of interference because they could emit high-intensity electromagnetic radiation.
 - Before turning on the power to the device, make sure that the supply voltage and frequency match the device's label or the requirements specified in this manual.
 - When the battery is about to exceed its service life, remove the battery immediately from the monitor.
 - To ensure patient safety, please use the accessories specified in this manual.
-

NOTE:

- Install the equipment in a location that is easy to observe, operate and maintain.
- If the monitor gets damp accidentally, or the liquid is dumped on the equipment or accessories, especially if the liquid is likely to enter the monitor, please contact the service personnel in time.
- The software is developed in accordance with IEC62304. The possibility of risks caused by program error has been minimized.
- The pictures and interfaces in this manual are for reference only, please in kind prevail.
- If there is no SD card, all data stored will lose when the device is turned off or a sudden power interruption happens.

1.2 Precautionary Measures

- In order to avoid the accumulation of electrostatic charge, it is recommended to store, maintain and use the equipment at a relative humidity of 30% or more. The floor should be covered with ESD dissipated carpets or similar materials. In the use of the components, non-synthetic clothing should be worn.
- In order to prevent electrostatic discharging to the ESD-sensitive parts of the device, the personnel should contact the metal frame of the components or the large metal objects near the device. When using the device, especially when it is possible to contact the ESD-sensitive parts of the device, the operator should wear a grounded bracelet designed for ESD-sensitive devices. For more information on proper use, please refer to the instructions provided with the bracelet.

ESD Precautionary procedure training

- All potential users are advised to understand the ESD warning symbols and receive training on ESD precautions.
- The most basic content of the ESD precautionary procedure training should include an introduction to electrostatic charge physics, voltage level in the conventional case, and damage to the electronic components when the operator with electrostatic charge contacts them. In addition, the methods for preventing electrostatic buildup, and the manner and reasons for the release of human body static electricity to the ground or equipment frame or the use of a bracelet to connect the human body to the equipment or the ground before establishing the connection should be described.

1.3 Symbols

Your device may not contain all the following symbols.

	Attention! Please read the accompanying file (the user manual).		Attention! Please read the accompanying file (the user manual).
	Battery		Manufacturer
	Alternating current		Use by
	Direct current		This way up
	Standby		Fragile, handle with care
	USB port		Keep dry
	Equipotential		Stacking layers limit
P/N	Part number		Atmospheric pressure limitation
	Batch code		Temperature limitation
	Serial number		Humidity limitation
	Date of manufacture		Internet access
	Danger of electrocution, main power supply AC 220V		
	Authorized representative in the European community		
	CE mark, it indicates that this product comply with the EU directive for medical devices 93/42/EEC		
	Waste disposal mark, this symbol indicates that the waste of electrical and electronic equipment cannot be disposed as an unclassified municipal waste and must be recovered separately.		
	This symbol indicates that the applied part belongs to type BF, also the unit contains type F isolated (floating) applied part, and it has defibrillation proof function, but does not include direct cardiac application.		
	This symbol indicates that the applied part belongs to type CF, also the unit contains type F isolated (floating) applied part, and it has defibrillation proof function, but does not include direct cardiac application.		
IPX0/IPX1	Ingress Protection		

Chapter 2 General

2.1 Introduction

Structure and composing: main unit, accessories (ECG lead cables, SpO₂ sensor, NIBP extension tube, NIBP cuff, TEMP probe, etc.) and power cord.

The monitor is applicable for the clinical monitoring of adult, pediatric and neonate(SpO₂ function is inapplicable on neonate in American). Physiological parameters including ECG (including ST-segment measurement and arrhythmia analysis), RESP, SpO₂, PR, NIBP, TEMP,IBP and CO₂, can be monitored. The monitoring information could be displayed, reviewed and printed.

WARNING

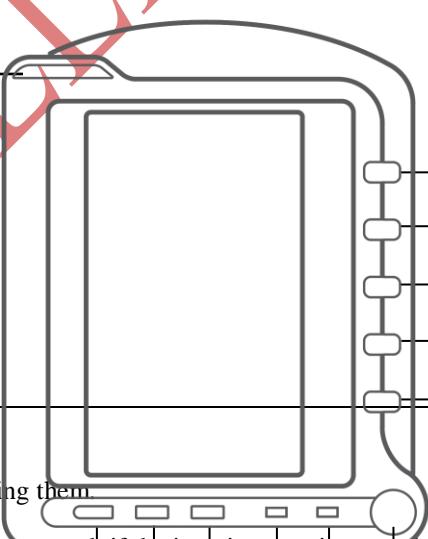
- The monitor should be used by a qualified clinician or under the guidance of a professional clinician. Personnel who uses this monitor should be adequately trained. The personnel without authorized or who are not trained, shall not carry out any operation.

2.2 Contraindications

No contraindications.

2.3 Main Unit

Front view

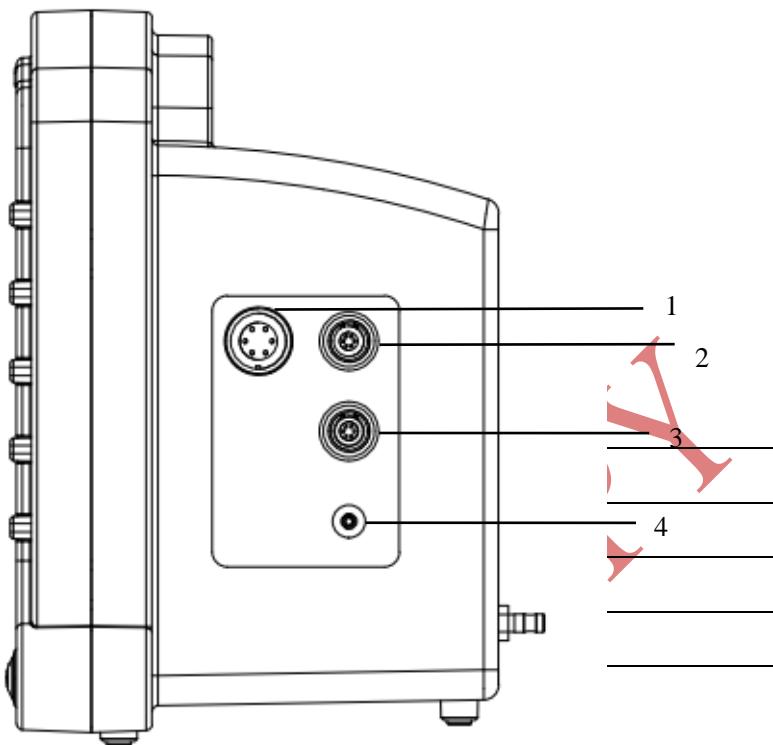


1/3	UP/DOWN: The user can switch the cursor by pressing them ▲ By pressing this key the cursor skip upward; if the item is numeric, press it to reduce. ▼ By pressing this key the cursor skip downward; if the item is numeric, press it to increase.
2	OK: Press it to confirm the change or operation. 1 2 3 4 5 6
4	AC indicator: On: the monitor is connected to AC power supply; Off: the monitor is disconnected from AC power supply.
5	Battery status indicator: it displays green and flickers under battery-powered condition, it always displays orange in charging state and green after fully charged.

6	ON/OFF ◆ ON: press this button to turn on the monitor ◆ OFF: in turning on state, keep pressing this button for 3 seconds can turn off the monitor.
7	MENU: Press this button to call up the SYSTEM MENU, in which the user may set up system information and perform review operation.
8	NIBP: Press it to inflate the cuff to start a blood pressure measurement. When measuring, press it to cancel the measurement and deflate the cuff.
9	FREEZE: Freeze or unfreeze the waveform
10	SILENCE: Push this button to suspend the alarm (with 1 minute and 2 minutes selectable), and a  symbol appears in the alarm area. Push this button for more than 1 second to mute all kinds of sounds (including alarm sound, heart beat, pulse tone, key sound). At the same time, a  symbol appears. Push this button again to restore all kinds of sounds and the  symbol disappears from the screen.
11	MAIN: exit button
12	Alarm indicator: indicating alarm level by different color and flicking frequency
13	Touch Screen This equipment adopts touch screen, which makes it convenient and fast operation. The system supports clicking and gliding. When the touch screen is not sensitive, select "Screen Calibration" in maintenance menu to calibrate.

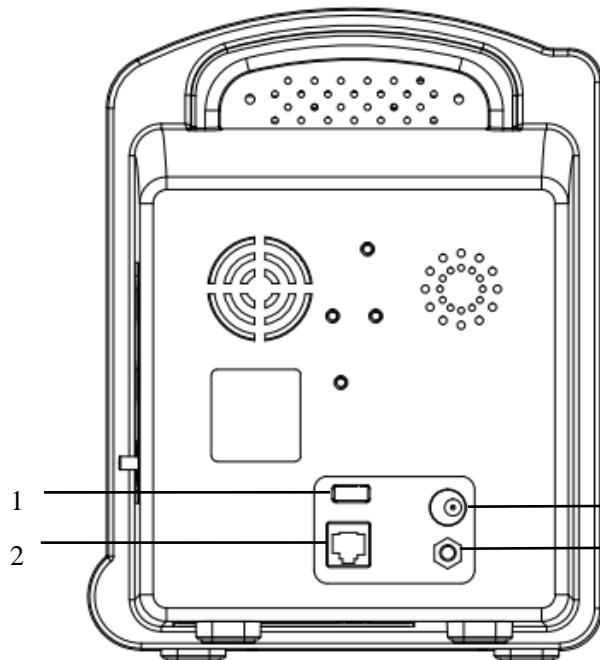
Side view

1	ECG: Socket
2	SpO ₂ : Socket
3	TEMP: Socket
4	NIBP: Socket



Rear view

CONTROLLEY



1	USB port: connecting with external memory devices
2	Network interface: standard RJ45 interface, connecting with the central monitoring system of our company by network cable
3	DC power port
4	Equipotential grounding terminal: when the monitor is used together with other equipment, use a cable to connect other equipment to the equipotential terminal of the monitor, which eliminates the ground potential difference between the different devices to ensure safety.

NOTE:

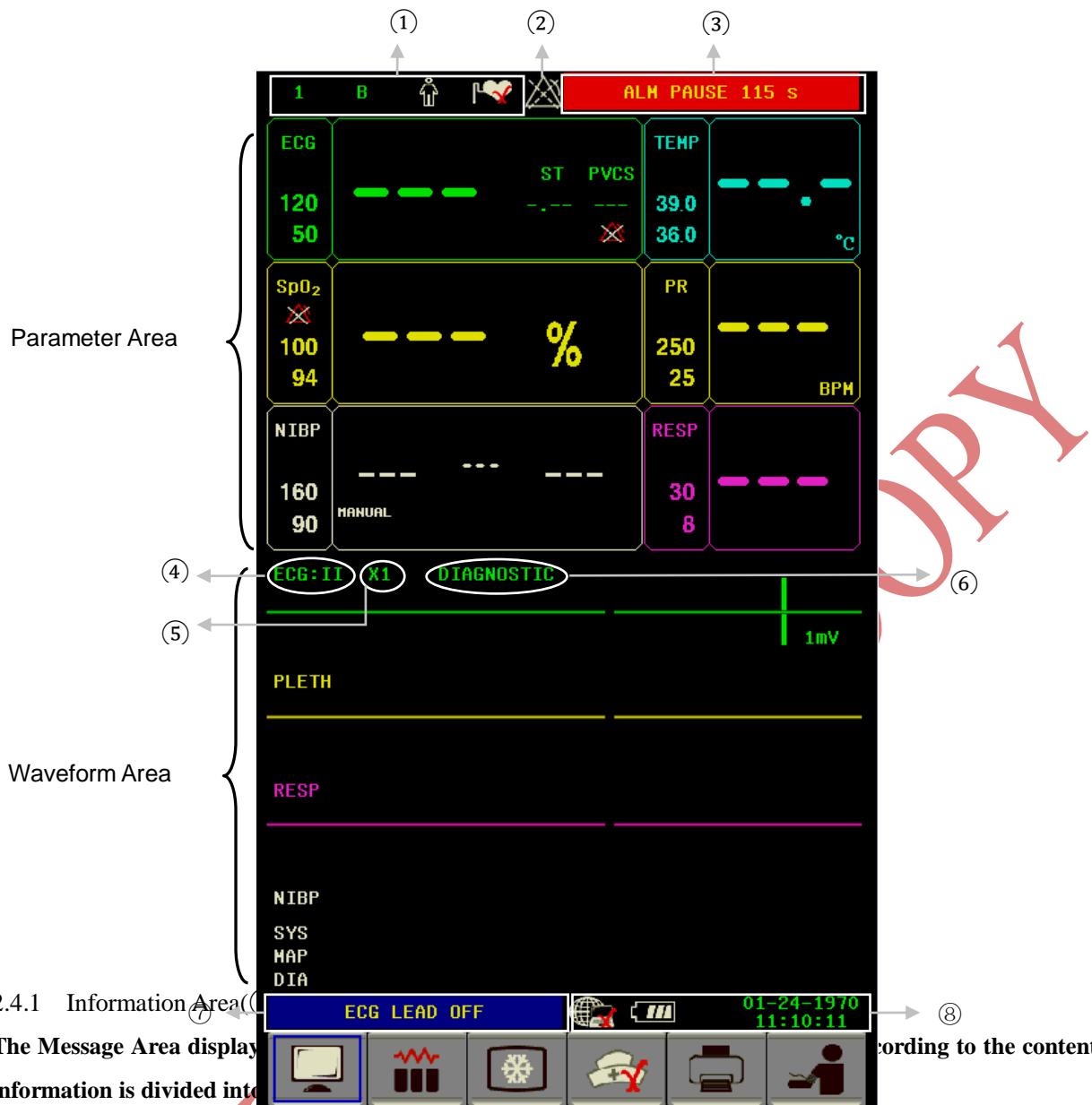
- **Replacement of fuse:** unplug the power cord, then disassemble the screws by using tools.
- **The network interface can only connect with the central monitoring system of our company to form a network monitoring system.**

2.4 Display

The display of monitor is a color screen, which can display the collected patient parameters, waveforms, alarm information as well as bed number, time and monitor status, etc.

The screen is divided into four areas:

- **Information area (①②③④⑤⑥⑦⑧)**
- **Function key area**
- **Waveform area**
- **Parameter area**



2.4.1 Information Area

The **Message Area** display information is divided into

- ① Patient information, pressing here can pop up "PATIENT SETUP" menu.

- 1: Bed number of patient under monitor
- B: Blood type
- Patient type is Adult.

Different icons represent different patient type: represents adult; represents pediatric;

represents neonate.

- the patient is with pacemaker

The patient is without pacemaker

- ② Alarm flag. There are three status:



flag for alarm PAUSE. Press “SILENCE” button once (less than 1 second) to mute all alarm and the flag appears at the same time. Press the button again to terminate the PAUSE status. The duration for PAUSE status can be 1 minute, 2 minutes or 3 minutes.



flag for alarm SILENCE. Press “SILENCE” button once (more than 1 second) to manually mute all the sounds and this flag appears at the same time. The SILENCE status terminates when you discharge the status or new alarm occurs.



flag for Alarm Volume Off. It indicates that you have closed the alarm sound permanently. This status terminates when you discharges the status.

⚠ Note ⚠

If symbol appears, the system will no longer give audible alarm sound. You must be very careful for using this function. Two ways can be used to discharge this status. One is to set the alarm volume to an option other than OFF in the USER MAINTAIN menu. The other method is to press SILENCE button to make the flag turn to . And then press SILENCE again and the system will restore the normal alarm status.

- ③ Physiological alarm area, when a physiological alarm occurs, the prompt information will display here.
- ④ Lead type: pressing here can pop up "lead type" list.
- ⑤ ECG gain: pressing here can pop up "ECG gain" list.
- ⑥ Filter way: pressing here can pop up "filter way" list, the options are diagnose, surgery, monitor.
- ⑦ Technical alarm area.
- ⑧ Display current **status of the monitor or sensor/probe**.

- indicates network is disconnected; flag indicates network is connected.
- battery status.
- **06-03-1949:** current date.
- **17:14:13:** current time.

2.4.2 Waveform area

In standard interface, the waveform area can display ECG, PLETH, RESP waveform and NIBP value in groups. All the waveforms in the system are listed in the "WAVE SWITCH" menu.

The name of the waveform displays on the upper left part of the waveform. The user can select ECG lead. The gain also displays. A 1mV scale bar displays on right side of ECG.

When menu is wanted during screen operation, the menu always occupies the fixed position at the bottom part of the waveform area, therefore, part of waveform can not be viewed temporarily. After exiting the menu, the system will restore the original screen.

The user may set up the rate to refresh the waveform. The method to adjust the refreshing rate of each waveform is

discussed in the setup description of each parameter.

2.4.3 Parameter area

The parameters displayed in the parameter area include:

ECG

- Heart rate or pulse rate (unit: beats/minute)
- The ST analyzing result of ECG (unit: mV)
- PVCs (unit: times/minute)

NIBP

- From left to right, there are Systolic pressure, Mean pressure and Diastolic pressure(unit: mmHg or kPa)

SpO₂

- SpO₂(unit: %)

PR

- Pulse Rate (unit: beats/minute)

RESP

- Respiration Rate (unit: times/minute)

TEMP

- Temperature (unit: °C or °F)

Alarm lamp and alarm status:

In normal status: the alarm lamp is not on.

When alarm exists, the alarm lamp flashes or lights on. The color of the lamp corresponds to the alarm level. Refer to related chapter: Alarm.

2.4.4 Function Region And Keys

- **Function Key In WAVEFORM AREA**



- **Function Key In The Lower Screen**



press the icon, MAIN MENU will pop up.



press the icon, TREND menu will pop up.



press the icon, FREEZE MENU will pop up.



indicates that nurse call function is unavailable.



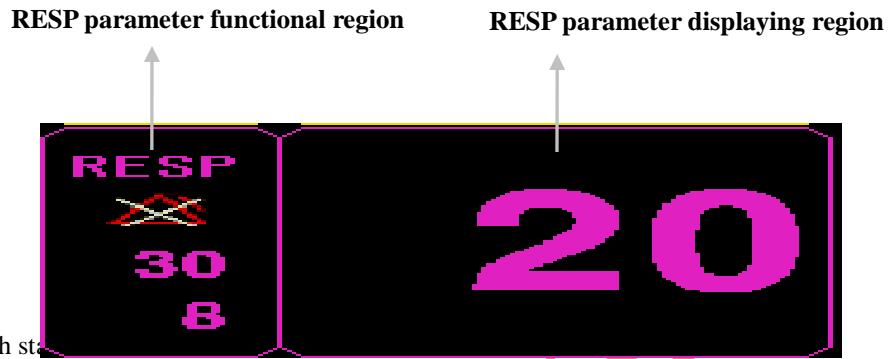
press this icon to start print.



start or stop inflation.

■ Function Region In The Parameter Area

Each parameter region have two parts: parameter function region and parameter displaying region.



Parameter function region:

- ✧ Displays parameter alarm switch state.
- ✧ Higher and lower alarm limits.
- ✧ If the area is pressed, the corresponding parameter menu will pop up. For example: press RESP parameter region will call up "RESP SETUP" menu.

Displaying region

- ✧ displays parameter value.

Chapter 3 Installation

The portable monitor is designed to comply with relevant safety requirements of IEC 60601-1, IEC 60601-2-27 and IEC 80601-2-30 for medical electrical equipment. The system has a floating input for defibrillation proof and electrosurgical knife protection. If the correct electrodes (see the section about ECG Monitoring) are used and placed according to the manufacturer's instructions, the display will be restored within 5 seconds after defibrillation.

WARNING

- If any sign of damage to the monitor function is detected, or an error message appears, do not use it on any patient. Contact biomedical engineer in the hospital or our maintenance engineer immediately.
- All analog and digital equipment connected to this device must be certified by specified IEC standards (e.g. IEC 60950 and IEC 60601-1), and all equipment shall comply with the requirements of IEC 60601-1-1 (valid versions) for connection. The person who connects the additional equipment to the input/output port, is responsible for the compliance with the IEC 60601-1-1 standard. If you have any questions, please contact us.
- When this device is connected to other electrical equipment in order to achieve a specific function, if the hazards of this combination can not be determined from the specifications of each equipment (for example, the risk of electric shock due to the accumulation of leakage current), please contact our company or experts in the hospital related this field to ensure that the necessary safety of all equipment in this combination will not be damaged.
- Please use our designated bracket (optional). When installing the bracket, please avoid the screws to touch the circuit board inside the machine.

NOTE:

- To ensure the monitor works normally, please read this chapter and the content about patient safety before use, and follow the requirements for installation.
- If the monitor finds any fatal error during self-test, it will alarm.
- Keep the package and packing materials for possible future transportation or storage.

3.1 Open the Package and Check

Before opening the package, please check it carefully. If any damage is found, please contact the carrier immediately.

Open the package and take out the monitor and accessories carefully. Check the components according to the packing list to see whether the device has any mechanical damage or any part is missing. If there is any problem, contact the our company immediately.

WARNING

- The disposal of packaging materials should obey the local regulations or the hospital waste disposal system. The packaging material must be keep out of the reach of children.
- The device may get biological contaminated during storage, transport or use. Please confirm that the package is intact before use, especially the disposable accessories. If any damage is found, please don't put is

into use.

NOTE:

- Keep the package and packing materials for possible future transportation or storage.

3.2 Environmental requirement

Please obey the following instructions to ensure the safety of electrical installation. The environment for portable monitor using shall properly away from vibration, dust, corrosive or flammable gas, extreme temperature or humidity and so on. When it is installed in a cabinet, there should be enough space in front of the device for convenient operation. When the door of the cabinet is opening, enough space at the back of the device should be guaranteed for convenient maintenance. Allow at least 2 inches (5 cm) of space around the instrument to ensure air circulation.

WARNING

- The environment for use, storage and transport should meets the requirements described in this manual, otherwise the specifications of this product stated in this manual may not be able to achieved, or even cause damage to the device.
-

Make sure that the device is free from condensation during working, when it is carried from one room to another room, condensation may appears. This is because it is exposed under humid air with different temperatures.

3.3 Install the Monitor

If everything goes well, please place the monitor on a flat surface or fix it on the wall. The installation of wall bracket please refer to its instructions.

3.3.1 Place on a Flat Surface

Place the monitor on a flat surface. The surface should be away from vibration, dust or corrosive drugs.

3.4 Connect the Power Cables

Please use the power cord equipped for the monitor. Plug the power cord to the power port on the monitor, and another end to a grounded three-core power socket.

If the monitor is equipped with an adopter, plug one end of the adopter to the power port on the monitor, and another end to a grounded three-core power socket.

NOTE:

- Plug the power cord to the hospital outlet. If necessary, connect it with the equipotential ground wire.
- When the device is equipped with battery, it must be charged after transport or storage. If turn on the device directly without connecting with AC power supply, it may not work normally due to lack of electricity.
The device can be charged after connecting with the AC power no matter it is turned on or not.

Ground

In order to protect patients and medical personnel, the enclosure of portable monitor must be grounded. Therefore, the portable monitor is equipped with a removable three-wire cable, when it is inserted into a matching three-wire socket, the device will be grounded through the ground wire in the power cord. If there is no three-wire socket, consult the

hospital's electrical management staff.

WARNING

- **Do not insert the three-core wire into a two-core socket.**

Connect the equipotential grounding terminal on the device to the grounding wire. If the hazards of a specific combination can not be determined from the specifications of each equipment (for example, the hazard caused by accumulation of leakage current), please contact the manufacturer or experts related this field to ensure that the necessary safety of all equipment in this combination will not be damaged.

Equipotential ground

The room protective grounding system is realized by power plugs grounding, it already includes the primary protection of the device. For internal examination of the heart or brain, the portable monitoring system must be individually connected to the equipotential grounding system. One end of the equipotential grounding wire (potential equalization wire) is connected to the equipotential grounding terminal on the rear panel of the device and the other end is connected to a connector of the equipotential system. If the protective grounding system is damaged, the equipotential grounding system undertakes the safety function of protecting the grounding wire. The examination of the heart (or brain) should only be carried out in a medical room with a protective grounding system. Before each use, check whether the device is in good working condition. The cable connecting the patient and the device must be free from electrolyte contamination.

3.5 Power on

3.5.1 Device inspection

■ Appearance inspection

Appearance inspection for the installed monitoring system:

- Carefully check the patient monitor for any mechanical damage.
- make sure the monitor is correctly installed according to the specified installation program.
- Make sure the cables connecting patient monitor and external equipment are undamaged, and connected to corresponding interfaces correctly.
- Make sure the external module is connected correctly.
- Make sure the battery cover is installed.

The chapter *Maintenance and Cleaning* provides detailed information about the cautions, requirements of cleaning, cleaning procedure and recommended cleaning agent.

■ Functional inspection

◆ Start

- 1) Plug the power cord to the AC power port. If the device uses internal battery for power, please make sure that there is enough battery power in the battery.
- 2) Turn on the patient monitor, it should start normally:
 - The red and yellow alarm lamp respectively light.
 - The system beeps for each time of powering on, and the LED indicator on control panel or the screen flickers once. If no beep sound or flickering, please stop using this monitor, and contact our company

for maintenance.

- There are no error messages appear on the screen.
- 3) Check all functions that the patient may need to ensure the device could work normally.
-

WARNING

- **When the monitor is powered on, the system will check whether the alarm function (audio and light alarms) is normal. If the alarm function works abnormally, this monitor can not be used for patient monitoring and contact the manufacturer's maintenance department.**
-

NOTE:

- **Charge the battery to full for the first time of use. Keep the monitor connecting with main power supply before the battery is fully charged.**



◆ Display

- 1) Ensure that all text are readable, and all images are clear.
- 2) Ensure that the device brightness is normal.



◆ Main unit

Check whether the time displayed on screen is correct. If necessary, please adjust its time and date.



◆ Check the Recorder

If your monitor is equipped with a recorder, open the recorder door to check if paper is properly installed. If it is out of paper, refer to the chapter *Recording* for details.

3.5.2 Start monitoring

- 1) Check whether the patient cables and sensors are correctly connected.
- 2) Check whether the settings of the monitor are correct, such as "PAT TYPE" and "Pacemaker".
- 3) For the detailed information about the measurement and monitoring of each parameter, please refer to relevant chapter.

3.6 Power off

Turn off the monitor according to the following steps:

- 1) Unplug the cables and sensors connecting with the patient.
- 2) Keep pressing ON/OFF button for 3 seconds to turn off the monitor.

Chapter 4 System Menu

This monitor features flexible configurations. You can customize monitoring content, waveform sweep speed, sound volume, and output content. Press the MENU button on the front panel of the monitor, the interface shown in the following figure will appear:



4.1 TIME SETUP

- 1) Select "TIME SETUP" item in the "SYSTEM SETUP" menu.
- 2) You can set the "Date" and "Time" items. Use cursor to highlight the item that you want to modify and turn the knob to select time.
- 3) Then select "SAVE" button.

System time displays with the format of year, month, date, hour, minute and second.



(1)hour

(2)minute

(3)second

- Hour setup: select area (1) then the background color of this area turns blue, select "+" to increase current hour, select "-" to decrease current hour.
- Minute setup: select area (2) then the background color of this area turns blue, select "+" to increase current minute, select "-" to decrease current minute.

- Second setup: select area ③ then the background color of this area turns blue, select "+" to increase current second, select "-" to decrease current second.
- Select "Save" to save current time and date, and the system data and time update.

NOTE:

- The system time shall be set when turning on the monitor (if you need to set the system time); otherwise, when you review the content containing time information, the system may not display the correct time.

4.2 PRINT SETUP

Select the "PRINT SETUP" item in the "MAIN MENU" to pop up the following menu:



- REC GRID: It is used to determine output format: OFF is without grid, and ON is with grid.
- WAVE 1/WAVE 2: the recorder can output two-channel waveform at most once. You can select "WAVE 1" and "WAVE 2" in turn, then select the wave name in the items. Select "OFF" to turn off the output of the selected wave. These settings are applicable for real-time recording and timing recording.
- RT REC: two options: "continuous" and "8s". "Continuous" indicates that, once pressing "REC/STOP" on the control panel, the recorder will continuously output the wave or parameters till pressing this button again.
- Auto recording: indicates the interval time for two outputs. Ten options: 10min, 20min, 30min, 40min, 50min, 1HOUR, 2HOUR, 3HOUR, 4HOUR and OFF. The system will trigger the recorder to output according to the selected time interval, the output time is fixed to 8 seconds.
- REC RATE: This item has two options, 25.0mm/s and 50.0 mm/s.
- CLEAR REC TASK: When too many recording tasks existing, you can use this function to clear the alarm event that has been generated and is waiting for outputting.

NOTE:

- The setup of "RT REC" takes priority over the "AUTO REC".
- The recorder is a optional component.
- If two same waveforms are selected, the system will automatically change one of the waveform to a different one.

4.3 ALM SETUP

Select "ALM SETUP" item in "MAIN MENU" to call up "ALARM" menu.

4.4 TREND RECALL

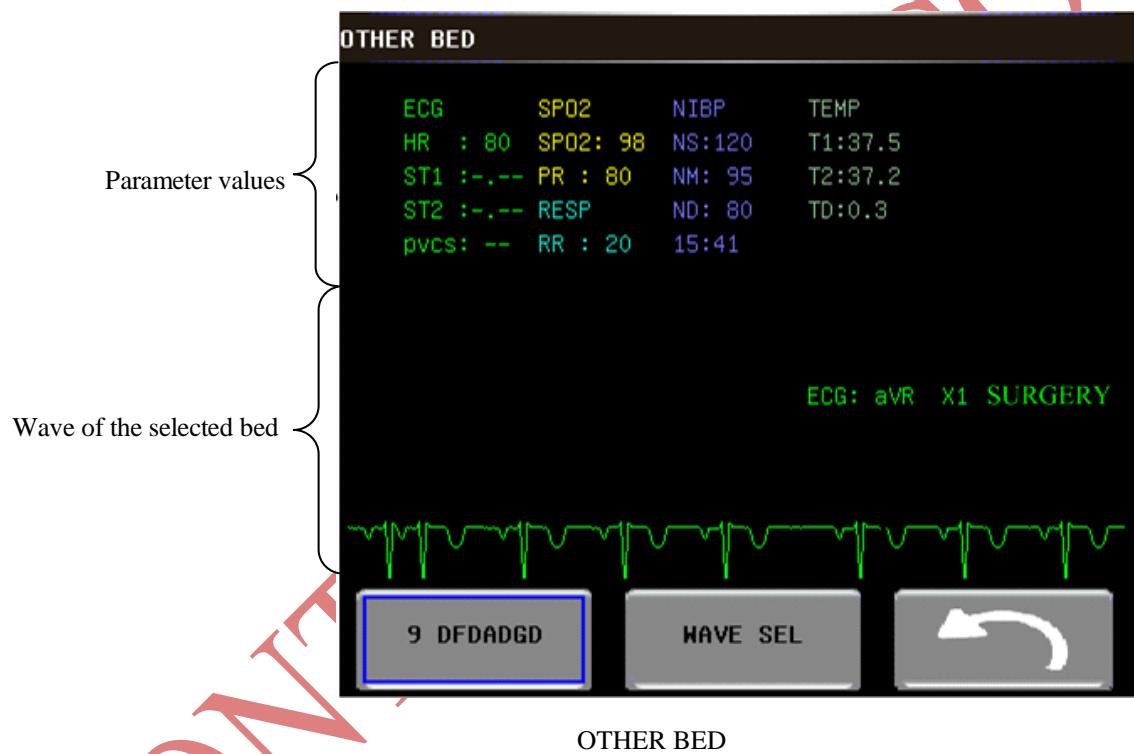
Select "TREND RECALL" in main menu.



Please refer to Chapter 8 "Recall" about "Trend Graph", "Trend Table", "NIBP Recall" and "Alarm Recall" under "Trend" interface for details.

4.5 OTHER BED

The monitor can display the wave of one parameter and all parameter values for other monitors located in the same monitoring network. Select "OTHER BED" in "MAIN MEME" interface to enter the following interface.



The monitor that used to view the situations of other monitors, is called "host monitor". The monitor being viewed is called "viewbed monitor". The viewbed screen is always displayed at the lower part of the host monitor's waveform area. It consists of the following parts.

① "BED SEL" button

Use it to select the monitor to be observed, and display the bed No. and patient name of other bed.

② Viewbed parameter area

All parameter data of the viewbed monitor is displayed in this area.

③ "WAVE SEL" button

Use it to select the wave of other bed to be observed, and display the name of selected wave.

④ Viewbed waveform area

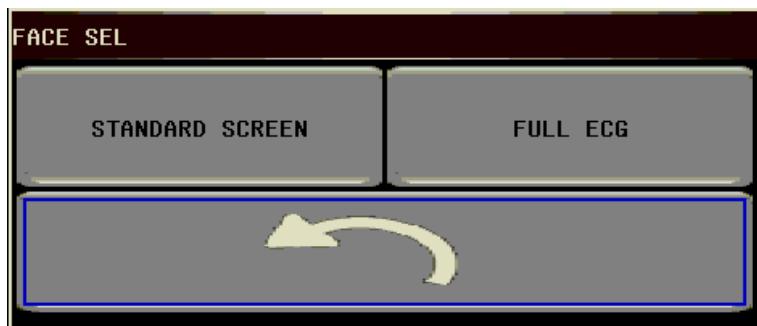
Other bed wave area locates under the other bed observation interface. The selected other bed wave is displayed

here. The scan speed is 25 mm/s. In addition, the relative information of the wave will also display above the wave.

4.6 FACE SETUP

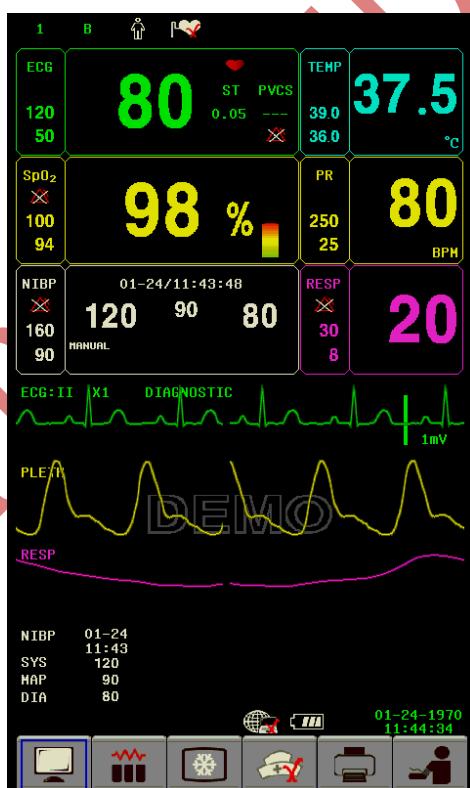
There are two available options: STANDARD SCREEN and FULL ECG.

Select “FACE SETUP” in “MAIN MENU” interface to enter the following interface.:



4.6.1 STAND SCREEN

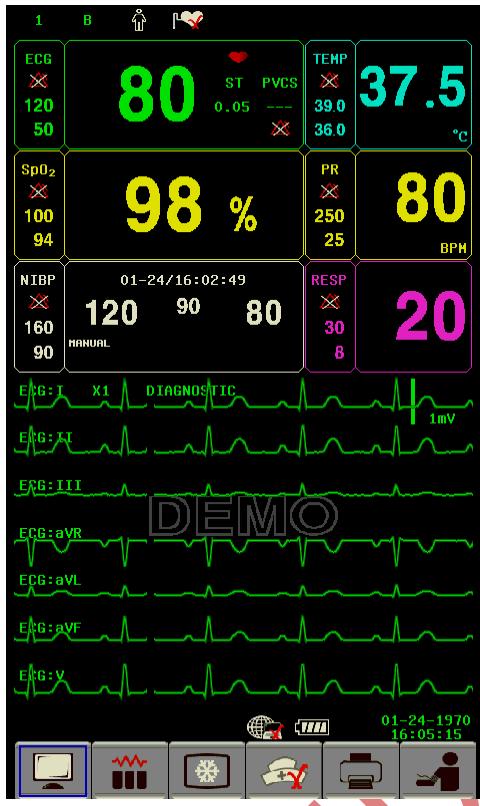
The default interface is “STANDARD SCREEN”. If the current interface is not the standard screen, select “FACE SETUP” in “MAIN MENU” interface to enter “FACE SEL” interface, then select “STANDARD SCREEN”.



Stand Screen

4.6.2 FULL ECG

If "FULL ECG" is selected, the full-lead ECG waveform will be displayed in the waveform area in one screen,



Full ECG

4.7 Parameter setup

Select [PARAM SETUP] item in “MAIN MENU” menu to pop up following menu:



Param Setup

4.7.1 Parameter select

You can choose the parameters to be monitored in this menu. This can avoid the interference from parameters that do not need attention.

For example, press "ECG OFF" in the menu, a list including two items "ON" and "OFF" pops up, select "ON", ECG parameter and ECG waveform display on the screen; select "OFF", ECG parameter and ECG waveform disappear from

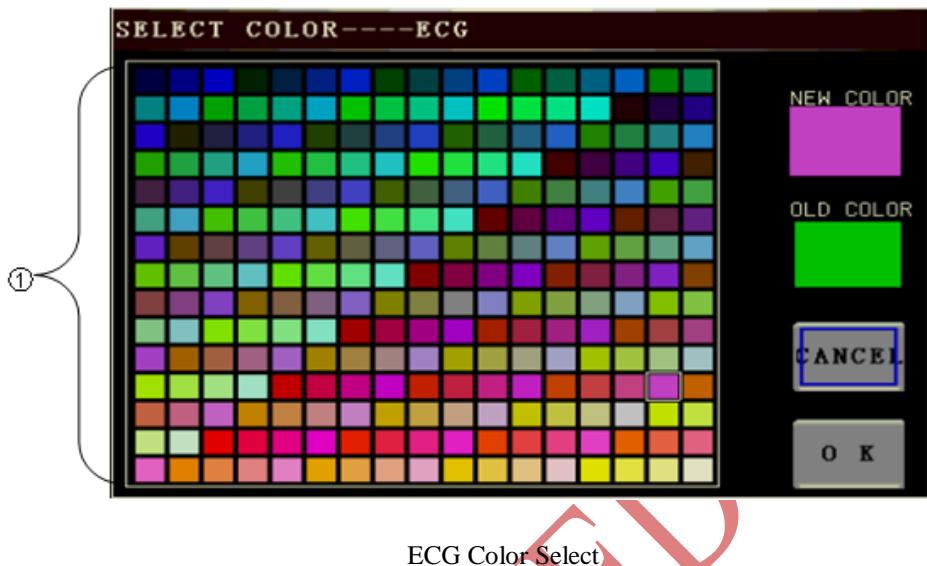
the screen.

⚠ Note ⚠

This function can be selected only when the current interface is the default one.

4.7.2 Color Setup

Select "ECG COLOR" in "PARAM SET" menu to pop up following menu:



For example, select "ECG COLOR" to call the menu.

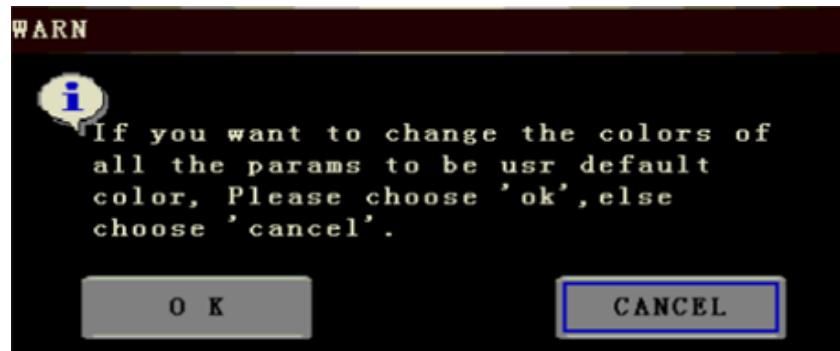
- ◆ NEW COLOR:Select color for ECG parameter and wave.
- ◆ OLD COLOR:The original color for ECG parameter and wave.
- ◆ CANCEL:Select it to cancel the color you have canceled and exit the dialog box.
- ◆ OK:Save the color you just selected and exit the dialog box.

⚠ Note ⚠

Use touch screen to select color in color palette.

4.7.3 Default color

Select "DEF COLOR" in "PARAM SET" menu to pop up the following menu:



- ◆ OK: Change all parameters and the color of the corresponding wave to the default value.
- ◆ Cancel: Exit this dialog box.

4.8 Wave setup

Select "WAVE SETUP" in "MAIN MENU", then you can select the wave to be displayed in the screen in this menu, to avoid the wave not to be noticed.



There is the wave in current interface.

There isn't the wave in current interface.

4.9 Maintenance

Select "MAINTAIN" in "MAIN MENU" to call up the "MAINTAIN MENU" dialog box, in which you can enter password and then customize maintenance setups.



Enter Maintain Password

4.9.1 User maintain

- Select “USER KEY” in “MAINTAIN MENU” interface.
- Enter 70808 and click “OK”, then the following items can be set in “USER MAINTAIN”interface.



User Maintain

- ◆ LANGUAGE: select the language you need
- ◆ LEAD NAME: EURO or AHA
- ◆ NET CONFIG: see Section **4.9.1.1 Network Configuration** for details
- ◆ ALM SOUND:you can set the alarm volume to “ON” or “OFF”.
- ◆ TOUCHER CAL:Click the button, a white "+" appears on left top of the screen. The user should click the center of the white "+", calibration will be finished when completing all Sclicking in different locations.
- ◆ DRAG RECTS:it refers to wether you can exchange the positon of parameter.

⚠ Note ⚠

When calibration, you should click the center of the white "+", or the screen will not respond to the clicking exactly. Once it happens, user should enter this menu again by buttons on front panel to recalibrate.

⚠ Warning ⚠

When the alarm volume is set to "OFF", you will not hear the alarm sound if new alarm occurs. Therefore, you must be very careful for using this selection.

If setting the alarm volume to "OFF" when the system is in Silence or Pause status, the system will automatically discharge Silence or Pause status.

If you select "Silence" or "Pause" when the alarm volume is set to "OFF", the system will restore the alarm volume before the alarm volume is set to "OFF" and enter Silence or Pause status.

⚠ Note ⚠

After the alarm volume is set to OFF, a  symbol will appear in the Technical Alarm Area.

⚠ Note ⚠

Setting Alarm Volume to "OFF" is valid only when the monitor is turned on for this time. After turning on the monitor next time, this setup will restore its value of the previous time when the system is turned on.

4.9.1.1 Network configuration

Click "NET CONFIG" item, the following menu will pop up:



NET CONFIG

NOTE:

- The monitor supports 3G, wireless and wire .

- ◆ 3G

It is strongly required to use the accompanying 3G bracket provided by manufacturer. CDMA2000 is appointed network, but WCDMA can be ordered.

- ◆ Wireless

It is strongly required to use the accompanying wireless network card provided by manufacturer. The router complied with IEEE802.11 (ordinary or household wireless network router) should be used, and it shall support the authentication method of WPA, WPA2 or WEP. Wireless network router should access to the Internet by WAN.

- ◆ Wire

The device has an interface for wire network mode, it accesses to wire LAN complied with IEEE802.3 by RJ45 connector. Wire network should access to the Internet by WAN of the router.

- NET TYPE: CMS or CUSTOM, select the network type according to your need

CMS:The Server IP is fixed "202.114.4.119". Once the monitor specifies the port number, the program will automatically obtain the local IP address and the port to be connected.

CUSTOM:In this mode, the IP address and subnet mask of the server, as well as the two items of this monitor can be set by user.

- WIRE TYPE: Wire / Wireless /3G

- ◆ **Wire:**When the network type is CMS, just make sure the connection between the device and the central station is successful. (The IP address of the server is 202.114.4.119, the IP address of this monitor and subnet mask are generated by the port number.)

When the network type is CUSTOM, make sure the monitor is connected to the router. If DHCP service is used, the device will automatically obtain the network support (dynamic IP of this monitor, gateway, DNS, etc.) through the DHCP. If specified IP is used, please set the IP address of this monitor and subnet mask.

- ◆ **Wireless**

After selecting wireless network, click "WIRELESS CONFIG" in "NET CONFIG" menu, then click "SEARCH

ROUTES". All searched routers will be listed on the screen, you can select one of them to connect as your need. If you choose a router set with secure connection, a dialog box will pop up for you to enter the password.

ROUTER NAME	ENCRYPTION	SIGNAL
LIJIANG_TEST	NONE	VERY GOOD
TP-LINK_70BF04	NONE	VERY GOOD
Milestone 3816	WPA	BAD
AndroidAP	NONE	BAD

MAC: 00:1e:e3:e5:f7:f4

SEARCH ROUTES PAGE UP PAGE DOWN STOP

When the network type is CMS, just make sure the connection between the device and the wireless router is successful. (The IP address of the server is 202.114.4.119, the IP address of this monitor and subnet mask are generated by the port number.)

When the network type is CUSTOM, if DHCP service is used, the device will automatically obtain the network support (dynamic IP of this monitor, gateway, DNS, etc.) through the DHCP. If specified IP is used, please set the IP address of this monitor and subnet mask, click "LOCAL IP CONFIG" button, the following menu will pop up:

LOCAL IP CONFIG

DHCP(Obtain an IP address)

Use the following IP address

IP ADDRESS: 202.114.4.115

SUBNET MASK: 255.255.255.0

DEFAULT GETWAY: 202.114.4.1

DNS SERVER: 0.0.0.0

OK CANCEL

◆ 3G

The 3G network is mainly used to connect with the central monitoring system through the Internet WAN.

After selecting 3G network, restart the device, then the device will automatically obtain the WAN support (dynamic ip, DNS, etc.) from 3G card and its driver.

NOTE:

- The 3G mode is available only when the "NET TYPE" is "CUSTOM". If the monitor is connected to central station, the central station software need to be installed on a server with fixed IP address, this address shall be set in the "SERVER IP".
- NET NO: the physical bed number of the monitor
- SERVER IP: input the IP address or domain name of the server for central station software
- LOCAL IP CONFIG: when the "NET TYPE" is "CUSTOM", you can set the local IP address
- WIRELESS: when the "WIRE TYPE" is set to "WIRELESS", click this button to enter the "WIRELESS CONFIG" menu, and start router searching and other operations.

4.9.1.2 Touch Screen Calibrate

Click the button, a white "+" appears on left top of the screen. The user should click the center of the white "+", calibration will be finished when completing all clicking in different locations.



Calibration Interface

Note

When calibration, you should click the center of the white "+", or the screen will not respond to the clicking exactly. Once it happens, user should enter this menu again by buttons on front panel to recalibrate.

4.9.1.3 Drag Rects

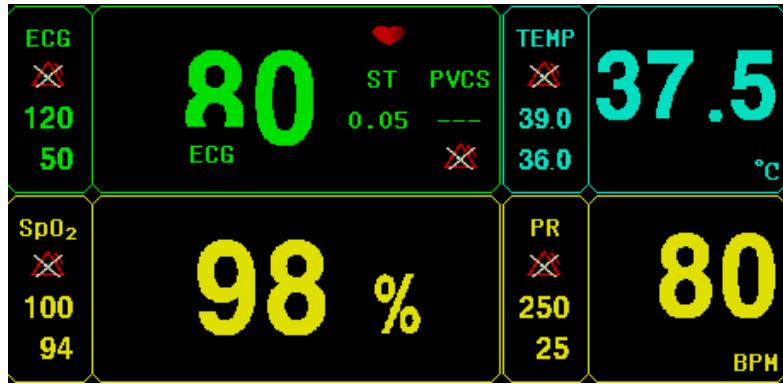
Exchange parameters display position.

In default interface, parameters' position is adjustable, any two parameters' position can be exchanged.

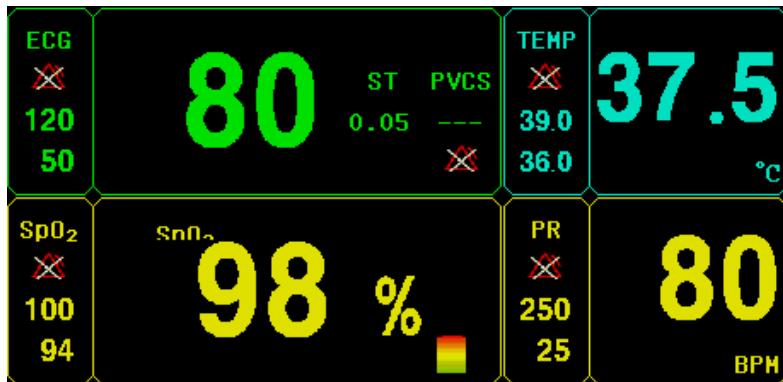
If you do, please follow the steps:

For example, if you want to exchange the position of ECG and SpO₂.

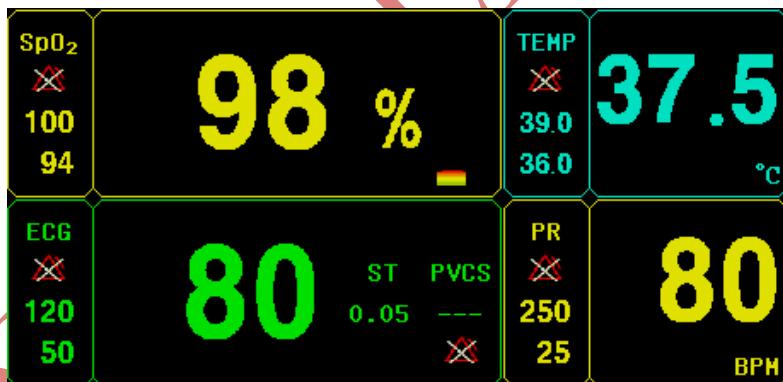
- Enter "User Maintenance" menu, make sure that "DRAG RECTS" is set to "on".
- Press ECG parameter displaying region, a small rectangle with "ECG" appears.



- Drag the small rectangle to SpO₂ parameter area.



- Lift the small rectangle with "ECG" disappears. Exchange of parameter area has completed



4.9.2 Factory maintain

- Select “FACTORY KEY” in “MAINTAIN MENU” interface.
- Enter the maintenance password to perform the factory maintenance.

4.9.3 SD OPERATE

Refer to chapter RECALL for details.

4.10 Machine version

Select the "VERSION" item in the "MAIN MENU". In the popping up menu, you can learn the software version of the monitor.

Software name	Device 1/Device 2
Specification	None.
Version	6.5X31200078.1669.7

Naming standard	"Major adaptive upgrade", "Major enhancive software upgrade", "Major improvement software upgrade", "Minor corrective software upgrades", "Build"
-----------------	---

4.11 Patient Information Setup

Select the "PATIENT SETUP" item in the "MAIN MENU", the following patient information can be set by user:

PATIENT SETUP			
DEPARTMENT	contec	PAT NO	sky
PAT NAME	american	BED NO	1
DOCTOR	doctorf	PAT SEX	FEMALE
ADMIT DAY	2009 2 28	PAT TYPE	ADU
BIRTH DAY	1942 2 28	BLOOD	B
WEIGHT	70.0	KG	
HEIGHT	175.0	CM	
SAVE		DELETE	RETURN

PATIENT SETUP

- DEPARTMENT: the department that the patient receives treatment
- PAT NAME: patient's name (Valid characters: a~z, A~Z, 0~9, and the space, 15 characters can be input at most)
- DOCTOR: name of the attending doctor
- ADMIT DAY: date of admission (format: year/month/day)
- BIRTH DAY: patient date of birth (format: year/month/day)
- Weight(kg/lb): patient's weight, the settings in the other menus involved in patient's height should be consistent with the settings here.
- Height(cm/inch): patient's height, the settings in the other menus involved in patient's height should be consistent with the settings here.
- PAT NO: case number of the patient
- BED NO: 0~9 can be entered, 4-digit at most
- PAT SEX: patient's gender (female, male)
- PAT TYPE: patient type (adult, pediatric, neonate)
- BLOOD: blood type of the patient ((Available options: A, B, O, AB, N, "N" means unknown blood type)
- PACE: "ON" means the detected signal will be marked by a "1" above the ECG waveform. "OFF" means no pacemaker analysis.

WARNING

- For a patient using pacemaker, the heart rate meter may count the pacemaker pulse when patient appears cardiac arrest or arrhythmia. Therefore, do not entirely rely on the alarms of heart rate meter. Patient with pacemaker should be closely monitored.
- If monitoring a patient with pacemaker, set "PACE" to On. If monitoring a patient without pacemaker, set "PACE" to Off. If "PACE" is on, the system will not perform some types of ARR analysis. For detailed

information, please refer to the section about arrhythmia analysis.

- When the "PACCE" is on, the arrhythmia events related to ventricular premature beat (including PVCs count) will not be detected, neither the ST segment analysis.

SAVE: to save the changes of patient information, corresponding information will be displayed in Patient information area

DELETE: to delete the information of current patient, and to register a new patient

After clicking the "DELETE" button in this menu, a dialog box "WARN" will pop up, you could select "OK" or "CANCEL" to decide whether to clear current patient information.



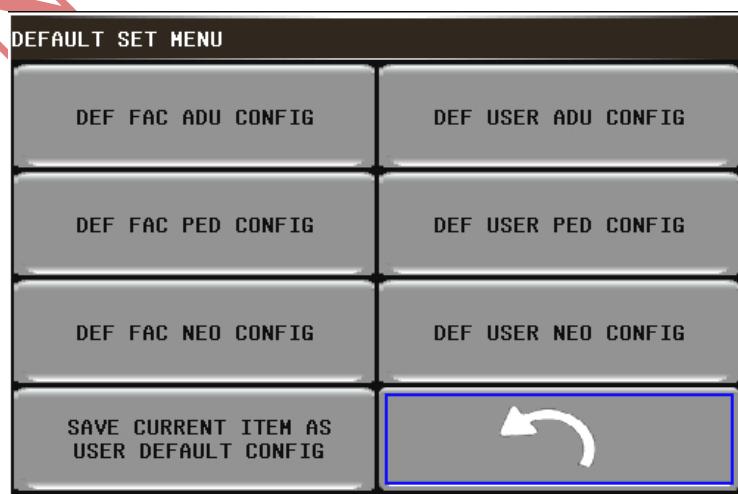
NOTE:

- If you choose "OK", the information of current patient will be deleted.
- Please click "SAVE" button if the information of current patient is changed, otherwise the changes will be invalid.

4.12 Default setup

⚠ Note ⚠

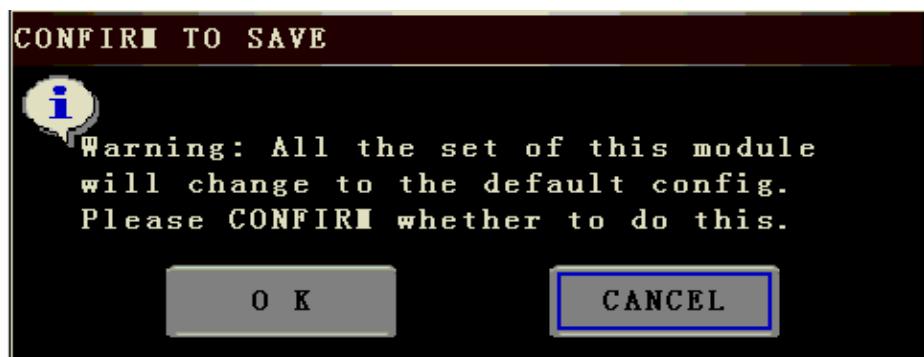
After selecting any item in this sub-menu, the selected item will replace the current setup of the system and become the system default configuration.



DEFAULT SET Menu

In this sub-menu, you can select both the factory default and the user-defined default. In this sub-menu, you can also

save the current system configuration as the user-defined default configuration. But at this same time, the system will automatically save all the setups in the parameter menu, ECG gain and filter way as the user-defined default configuration according to the patient type. Also, the dialog box as shown below will pop up:



CONFIRM DEFAULT CONFIG

⚠ Note ⚠

After selecting any item in the DEFAULT menu and exiting the box, the “CONFIRM TO SAVE” dialog box will pop up, in which you can select [OK] to confirm your selection or [CANCEL] to give up your selection.

⚠ Warning ⚠

All configurations in the system will be replaced by “default configurations”.

4.13 Additional Function

Select "ADDIT FUNC" in "MAIN MENU", then following functions can be selected.



Additional Function

- Drug calculation: You can use the drug calculation and titration table function of the monitor to calculate the concentration of 15 kinds of drugs. Refer to the Chapter Drug Calculation and Titration Table for detailed information.
- Mark event: Click it to "Mark Event" menu

In the process of monitoring a patient, the occurrence of some events may have impacts on the patient, resulting in some changes on the waveform or parameters. To analyse these effects, you can manually mark some specific events. The event will be displayed on the trend graph and trend table to assist the analysis of patient's parameters

at the time of the event.

The monitor has four types of events. You can specify their representations by yourself.

How to mark the event:

1. Use the rotary knob to select one from event A, B, C and D.
2. The @ symbol will appear in the front of the event being selected.
3. Once making a wrong selection, you can push the knob on the event again to give up the selection. Select "EXIT" to exit the menu and consequently the selection will come into effect.

■ Nurse calling: Unavailable

■ Font W H Ratio: unavailable

Setup the rate of wide and height of the numbers showed in param-showing region.(RANGE: 0.5--2.0)

■ SD OPERATE: Refer to **8.5 SD CARD** for details.

4.14 Demo

Select the "DEMO MODE" item in the "MAIN MENU" to enter the "INPUT DEMO KEY" dialog box. Input the password "88888", and click "CONFIRM" button, the system will enter DEMO status.

The demo waveform is an analog waveform set by the manufacturer only to show the performance of the machine and to train users.

In clinical application, this function is forbidden because it may mislead the medical staff to treat the DEMO waveform and parameters as the actual data of the patient, which may result in the delay of treatment or mistreatment. Therefore before entering this menu, you shall enter the password.



Input Demo Key

Chapter 5 Alarm

When the patient being monitored appears abnormal changes in vital signs, or the monitor itself occurs failure and fails to monitor the patient, it will remind the medical workers through sound, light, etc.

WARNING

- In any single area (e.g. intensive care unit or cardiac operating room), there is a potential hazard that the same or similar devices use different alarm preset.
 - When the monitor is powered on, the system will check whether the alarm function (audio and light alarms) is normal.
 - When turning on the monitor, the system will send a beep sound and the alarm light flickers once. This function is used to check whether the alarm function is normal. Therefore, user shall pay attention to these signs when turning on the device. If the alarm function works abnormally, this monitor can not be used for patient monitoring, please contact the manufacturer or the maintenance service center.
-

5.1 Alarm classification

The alarm is classified as physiological alarm, technical alarm and prompt message based on the property of alarms.

1. Physiological alarm

Generally, physiological alarm is activated in the following situations: one of the patient's physiological parameters exceeds the alarm limits, or the patient appears physiological abnormal, for example, HR exceeding the set limit. The information of physiological alarm is displayed in physiological alarm area.

2. Technical alarm

Technical alarm represents the alarms activated by abnormal monitoring or monitoring result distortion due to system failure, such as lead-off or low battery. The information of technical alarm is displayed in technical alarm area.

3. Prompt message

Except the physiological alarm and technical alarm, these messages refer to the displayed information about system status, which are not involved with patient vital signs. Prompt messages are often displayed in technical alarm area. Besides, some prompt messages are displayed in parameter area, for example, the messages related to NIBP are displayed in NIBP area.

5.2 Alarm level

The alarm is classified as high-level alarm, medium-level alarm and low-level alarm according to its severity.

1. High-level alarm

High-level alarm indicates the patient's life is in danger or the monitor under using has serious problem in technical respect. It is the most serious alarm.

2. Medium-level alarm

Medium-level alarm means serious warning.

3. Low-level alarm

Low-level alarm is a general warning.

NOTE:

- The level of all technical alarms and prompt messages and some of the physiological alarms are determined

-
- by the system, which can not be changed by user.
 - The level of most of the physiological alarms need to be set by user, such as alarm limits.

5.3 Alarm mode

When alarm occurs, the monitor may draw the user's attention in three ways as below:

- Audio alarm
- Light alarm
- Alarm message

5.3.1 Audio alarm

When alarm occurs, the monitor will make different sound to indicate alarms in different levels.

- High: "beep-beep-beep----beep-beep, beep-beep-beep---beep-beep", frequency: every 8 seconds
- Medium: "beep--beep-beep", frequency: every 8 seconds
- Low: "beep", frequency: every 8 seconds

Sound pressure range: 45 dB~85 dB

5.3.2 Light alarm

When alarm occurs, the alarm indicator will prompt different levels of alarms with different colors and flicker frequencies..

- High: alarm indicator flickers in red with high frequency
- Medium: alarm indicator flickers in yellow with low frequency
- Low: alarm indicator lights in yellow without flickering

Alarm position: monitor or central monitoring system(if connected)

5.3.3 Alarm message

When alarm occurs, alarm messages will be displayed in physiological alarm area and technical alarm area. For physiological alarms, the following marks will be used in front of the messages to indicate the alarm level.

- High: ***
- Medium: **
- Low: *

The system also adopts different background to indicate the alarm level of physiological alarm and technical alarm.

- High: red
- Medium: yellow
- Low: yellow

NOTE:

- If one monitoring system has multiple alarm equipment, when an alarm occurs, the visual and audio prompts generated by all alarm equipment should keep the same.
- The way of alarm prompting is related to its level.
- When alarms of different levels occur at the same time, the monitor prompts the highest level alarm among them.

5.4 Alarm setup

Select "ALM SETUP" item in the "MAIN MENU". Under this interface, user could set information about alarm sound and so on.



ALARM Menu

- ALM VOL: selective from 1~7, 1 is the minimum volume, 7 is the maximum volume.
- ALM REC: three options: 8 s, 16 s, 32 s.
- PAUSE_T: two options: 1 min and 2 min.
- Key volume: 8 options, 0~7. 1: the minimum volume, 7: the maximum volume, 0: turn off the volume.
- PAUSE:alarm pause ON/OFF.

WARNING

- When the alarm sound is turned off, the monitor will not make any sound even if a new alarm is triggered. Therefore, user must carefully choose whether to turn off the alarm sound.
- In SILENCE or ALARM PAUSE status, set the alarm sound is as "OFF", then the system will automatically terminate the status of SILENCE or ALARM PAUSE.
- When the alarm sound is "OFF", if the operator selects "SILENCE" or "ALARM PAUSE", the alarm sound will be restored to the previous volume when it is turned off, and at this time, the system will enter the status of silence or pause accordingly.
- Do not rely on the sound alarm system only for patient monitoring, user should pay close attention to the patient's actual clinical situation.

NOTE:

- When alarm sound is turned off, a symbol "🔕" will be displayed in technical alarm area.
- The alarm sound off is only valid when the device keeps turning on, once the device is restarted, this setup will be restored to the previous set value.
- The symbol "🔕" means that the alarm sound is turned off, the system could not make any sound for the

alarm, so user must be careful when using this function. There are two ways to exit this status. Method 1: Set the alarm sound as "ON" in the "ALARM SETUP". Method 2: Press the "SILENCE" button, the symbol will become "", then press the "SILENCE" button one more time, the system will return to normal alarm status.

■ Parameter Alarm setup

- ◆ The parameter alarms can be set in "PARAM ALM SETUP", or their individual parameter menu.
- ◆ When a parameter alarm is off, a symbol "" displays near the parameter.
- ◆ For the parameter whose alarm is set to "ON", the alarm will be triggered when at least one of the parameters exceeds alarm limit. The monitor will take the following actions:
 - The screen displays the alarm information in a mode as described above;
 - The monitor beeps in its corresponding alarm level and volume;
 - Alarm indicator lights or flickers;
 - Information of all parameter values at the alarm moment, and the waveform 4/8/16 seconds before and after the alarm are stored.
 - If alarm recording is on, the recorder starts alarm recording. Refer to the chapter *Recording* for details.
- ◆ The following information can be set in parameter alarm setup.
 - ECG ALM SETUP: ALARM ON/OFF, ALARM REC(ON/OFF), ALM LEV, ALARM limits (high/low), ST alarm setup, ARR alarm setup;
 - ST ALM SET: ALARM(ON/OFF), ALARM REC(ON/OFF), ALM LEV(LOW/MED/HIGH), ST1ALM HI(0.20), ST1/ST2 ALM LOW(-0.20)
 - PVCS ALM SET: ALARM (ON/OFF), ALM REC(ON/OFF), ALM LEV(LOW/MED/HIGH), ALM HIGH(0~30).
 - RESP ALM SET: ALARM ON/OFF, ALARM REC, ALARM level, ALARM limits (high/low), apnea alarm;
 - SpO₂ ALM SETUP: ALARM ON/OFF, ALARM REC, ALARM level, ALARM limits (high/low);
 - NIBP ALM SETUP: ALARM ON/OFF, ALARM REC, ALARM level, SYS ALARM limits (high/low), MAP alarm limits (high/low), DIA alarm limits (high/low);
 - TEMP ALM SETUP: ALARM ON/OFF, ALARM REC, ALARM level, T1 ALARM limits (high/low), T2 ALARM limits (high/low).

5.5 Alarm status

Except general alarm conditions, you can set the monitor to four different alarm status as below according to your need. The four alarm status have different symbols:

 Alarm pause

 Alarm off



Silence



Alarm sound off

5.5.1 Silence

Keep pressing the "SILENCE" button (over 1 second) on the control panel will turn off all the sounds. In SILENCE status, pressing the "SILENCE" button (no more than 1 second) will switch to the "ALARM PAUSE" status, and the alarm will be suspended temporarily in accordance with the time set before. In SILENCE status, keep pressing the "SILENCE" button (over 1 second), the system will exit current status and restore the alarm sound correspondingly, and back to normal alarm status. When the system is in "SILENCE" state, any new triggered alarm can terminate the "SILENCE" state, the system will return to normal alarm state (sound and light alarm).

5.5.2 Alarm pause

Short press "SILENCE" on control panel or click "PAUSE OFF" in "ALARM MENU" interface to turn off all alarm sound, light prompts and physiological alarm description information, to make the system enter into the state of "ALARM PAUSE". The countdown of alarm pause is displayed in the physiological alarm area and the symbol "" is displayed in this area as well.

Time period of Alarm Pause: 1 min and 2 min.

The system can return to normal state after pressing "SILENCE" or clicking "PAUSE OFF" in "ALARM MENU" interface again. In addition, a new triggered alarm can also eliminate the "ALARM PAUSE" state, and the symbol "" disappears.

NOTE:

- After returning to the normal state, the presence of an alarm depends on whether the alarm condition is appropriate, but after the "SILENCE" button is pressed, the system will permanently turn off the alarm sound for lead-off or probe-off.
- The alarm pause time can be set in the "ALARM SETUP" menu as required, the default setting is 2 min.

5.6 Measures for Alarm occurs

The alarm message appears in system information area or system alarm area. It is needed to identify the alarm and take actions appropriately according to the cause of the alarm.

- 1) Check the patient's condition;
- 2) Confirm the alarming parameter or the type of the alarm;
- 3) Identify the cause of the alarm;
- 4) Silence the alarm, if necessary;
- 5) When cause of alarm has been solved, check that the alarm is working properly.

You will find the alarm messages and prompts for each parameter in corresponding chapters related to this parameter in this manual.

5.7 Probe-off alarm

When “Probe-off” alarm occurs, long press “SILENCE” on the front panel for more than 1s, the device will not perform audible alarm for probe-off, but remind user in the form of information.

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Chapter 6 Freeze

When monitoring a patient, you may freeze the waveform to view it carefully. Up to 34 seconds waveform can be reviewed. Besides, the frozen waveform can be output by recorder. The Freeze function of this monitor has following features:

- Freeze status can be activated under any operating screen.
- When entering the Freeze status, the system exits all other operating menus. At the same time, the system freezes all waveforms in the Waveform area, or full-lead ECG waveforms and the extra waveform (if available) on the Full-lead ECG screen. Nevertheless the Parameter area refreshes normally.
- The frozen waveforms can be reviewed or recorded.

6.1 Enter/Exit Freeze Status

6.1.1 Enter Freeze Status

Under non-frozen state, press “FREEZE” on control panel or click “

6.1.2 Exit Freeze Status

In the Freeze status, executing any of the following operations will command the system to exit the Freeze status:

- Select the “- Press the "FREEZE" button on the front panel again;
- Press the non-immediate-to-execute button on the front panel and system buttons of MAIN and MENU;
- Execute any operation that may trigger the adjustment of the screen or display of a new menu.

After exiting the Freeze status, the system will discharge the Freeze status, clear screen waveforms and resume to display real-time waveforms.

6.2 FREEZE Menu

Press “FREEZE” on control panel or click “

The image shows a screenshot of a computer monitor displaying the "FREEZE MENU". The menu is a horizontal bar with a dark background and light-colored text. It contains six items: "WAVE 1 ECG", "WAVE 2 SPO2", "LEFT", "RIGHT", "REC", and a blue square containing a white circular arrow icon. The "REC" item is highlighted with a blue border around its entire box. Below the menu, the text "FREEZE Menu" is centered.

- WAVE 1: to select the first frozen waveform to record. The pull-down list of this item gives you the names of all frozen waveforms displayed on the screen.
- WAVE 2: to select the second frozen waveform to record. The pull-down list of this item gives you the names of all waveforms displayed on the screen.
- LEFT/RIGHT: to review frozen waveforms.
- REC: after selected, the system begins recording the frozen waveforms selected in "WAVE 1" and "WAVE 2".
- : after pressed, the system closes the FREEZE menu and exits the Freeze status.

6.3 Reviewing Frozen Waveform

By moving the waveform, you may review a waveform of 34 seconds before the moment when it is frozen. For a waveform less than 34 seconds, the remaining part is displayed as a straight line. Press "LEFT" or "RIGHT" in the sub-menu, the frozen wave on the screen will move to left or right following it. The time scale locates on the top right of the first channel wave, the freezing moment is "0 s". With waveforms moving right, this time mark will turn into "-1 s, -2 s, -3 s...".

6.4 Recording Frozen Waveform

In the Freeze status, you may output displayed frozen waveforms via the recorder. Maximum 2 waveforms can be output at one time. On the FREEZE menu, the pull-down lists of both "WAVE 1" and "WAVE 2" give you all names of frozen waveforms on the screen, from which you may select two waveforms. Select the "REC" option on the FREEZE menu to output parameters generated upon the freezing moment and the two selected frozen waveforms. If one of the two selected waveforms is set off or not available, only parameters and the other waveform are recorded. If these two selected waveforms are all set off or not available, only parameters are recorded. As for the function of recording frozen waveforms, you can only record the waveforms displayed upon the freezing moment. The recording time length is the same as the length of the waveform displayed on the screen. For example, if the speed of a waveform is relatively fast, then it needs shorter time to record it. When recording frozen waveforms, the system is still in the Freeze status. After completion of this recording, if required, you may select another waveform to be output, and select "REC" option again to record until the all necessary waveforms are recorded. You may also record frozen waveforms by pressing the "REC/STOP" button on the front panel. If selecting "REC" option without installing a recorder, the system will prompt "RECORDER ERROR" in the status bar. For more detailed information about recording, please refer to the chapter *Recording*.

Chapter 7 Recording

NOTE:

- The recorder is an optional component.

7.1 General Information for Recorder

A thermal array recorder is used for the Monitor.

Performance of the Recorder

- Recording speed: 25 mm/s or 50 mm/s.
- Waveform recording width: 48mm
- It can record up to 2 waveforms.
- The time and waveform of real-time recording are user-configurable.
- Auto recording interval is set by user, the waveform is in accordance with the real time recording.
- The alarm recording waveform is automatically selected by the monitor.

NOTE:

- It is recommended to stop the recording when low battery alarm generated. Otherwise, the device may shutdown for out of power.

7.2 Recording Type

The monitor provides several stripe recording types:

- ◊ Continuous real-time recording
- ◊ 8 seconds real-time recording
- ◊ Auto 8 seconds recording
- ◊ Alarm recording
- ◊ Freeze waveform recording
- ◊ Trend graph/table recording
- ◊ ARR review recording
- ◊ Alarm recall recording
- ◊ NIBP recall recording
- ◊ SD recall recording
- ◊ Drug calculation titration recording

■ Real-time Recording

Real-time recording starts as you pressing the "  " on the function area.

The waveforms for continuous real-time recording and continuous 8 seconds recording are set in system setup (usually the first two waveforms are displayed on the screen). You can also configure it through the menu. Refer to related section for details.

In RECORD SETUP menu, user can choose to print two different waveforms at the same time, or print only one waveform by setting the other waveform off. If two waveforms are set off, the real time record will print out measured parameters only.

NOTE:

- If certain recording is in process, and another parameter demands alarm recording, it will only be executed after the earlier recording is finished.

■ Auto Recording

The monitor starts a recording for 8 seconds according to interval time set in the "AUTO REC" of the "PRINT SETUP" menu. Refer to the section "RECORD" in system setup for details.

■ Alarm Recording**◆ Parameter Alarm**

The monitor records waveforms 4/8/16 seconds before and after the alarm (totally 8, 16 or 32 seconds) (which can be selected in System Menu).

All parameter values during the alarm will also be recorded.

Two waveforms will be output according to the following rules:

- 1) If multiple parameter alarms are switched on and triggered simultaneously, the recorder will print out those of the highest level. If parameters have the same alarm level, the latest alarm will be printed out.
- 2) If an alarm occurs during the recording of another parameter, it will be printed out after the current recording is finished.
- 3) If many alarms occur at the same time, their waveforms will be stored, and then printed in turn.

◆ ST Segment Alarm

The monitor records 2-channel ECG waveforms 4, 8, or 16 seconds prior to and after the ST alarm (totally 8, 16, or 32 seconds) (which can be selected in the menu). All parameter values during the alarm will also be recorded.

◆ Arrhythmia Alarm

The monitor records the waveform 4 seconds prior to and after the alarm (totally 8 seconds). All measurement results during the alarm will also be recorded.

■ Freeze Waveform Recording

The monitor prints out the selected waveforms under the FREEZE mode. In this way you can capture the abnormal waveforms on the screen by freezing and record it.

■ Trend Graph/Table Recording

The monitor can print out the trend graph and table in the current trend review interface.

■ Arrhythmia Review Recording

The monitor can print out the arrhythmia alarm event in the current ARR RECALL interface.

■ Alarm Recall Recording

The monitor can print out the alarm events in the current ALARM RECALL interface.

■ NIBP Recall Recording

The monitor can print out all the NIBP review events in NIBP RECALL interface.

■ Titration Table

The monitor can print out the messages in the current TITRATION interface.

■ Notes on Recording

- Recording type:
 - Real-time recording
 - Periodic recording
 - Para alarm recording
 - Arrhythmia recording
 - Freeze waveform recording
 - Trend Graph
 - Trend Table
 - Para alarm review
 - NIBP review
 - Titration Table
- Alarm parameters, alarm time and freeze time
- Patient bed number, sex, height, weight, date of birth, admission date
- Parameter name and value
- Recording time
- Waveform name
- Waveform amplitude (for ECG waveform only)
- ECG lead, scale, filter mode (if having ECG waveforms, it will be printed out within the first second or when changing the lead, gain and filter mode during real-time recording.)
- Date and time

7.3 Recording Start&Stop

Here are the methods for how to start the recording of each type:

Continuous real-time recording	Press  on the function area to start/stop the recording.
8 second real-time recording	Press  on the function area to start recording. It will automatically stop in 8 seconds.
Auto recording	Record the two waveforms selected in PRINT SETUP menu according to the setup time interval in PRINT SETUP menu.
Alarm recording	When alarm recording is set ON, it automatically starts when alarm occurs.
Frozen waveform recording	<p>After accessing FREEZE menu, use UP\DOWN and OK button or press the "WAVE1\WAVE2" button to select two waveforms to be output. Then press "REC" button in the menu to print out the waveforms.</p>  <p>If two waveforms are off, the measure parameters in frozen are</p>

	printed out only.
Trend graph recording	Pick "REC" button in the "TREND GRAPH" menu when viewing the trend graph to print out the currently displayed trend graph.
Trend table recording	Pick "REC" button in the "TREND TABLE" menu when viewing the trend table to printout the currently displayed trend table.
Arrhythmia review recording	Access ARR RECALL window from ARR ANALYSIS of ECG SETUP menu and Pick "WAVE" button to access "ARR WAVE RECALL" menu. Then press "REC" button to output the Arr. Waveform and related information currently displayed on the screen.
Alarm review recording	Access the "ALM RECALL" window in "TREND MENU" menu from "MAIN MENU" and pick "REC" button to print out the alarm review waveform and related information currently displayed in the "ALARM RECALL" window.
NIBP review recording	Access the "NIBP RECALL" window in "TREND MENU" and pick "REC" button to print out the NIBP information currently displayed in the window.

Access the "PRINT MENU" menu from the "MAIN MENU". Then select the "CLEAR REC TASK" button, all recording tasks will be stopped, and all stored alarms will be cleared.

NOTE:

- You can press REC/STOP button on the control panel to stop any current recording process.

7.4 Recorder Operations and Status Messages

■ Requirement for Record Paper

Only record paper satisfied the requirement can be used, otherwise the recorder may not work normally, or the recording quality may be poor, or the thermosensitive printer head may be damaged.

■ Proper FunctioningS

- ◆ When the recorder is working, the record paper goes out steadily. Do not pull the paper, or the recorder will be damaged.
- ◆ Do not operate the recorder without record paper.

■ Paper Out

When "RECORDER OUT OF PAPER" alarm is displayed, the recorder cannot start. Please insert record paper properly.

■ Inserting Paper

- Open the recorder catch.
- Insert a new roll of paper into the paper cassette, printing side facing the thermosensitive printhead.
- Give out the paper from the recorder outlet.

- Close the recorder catch.

NOTE:

- Be careful when inserting paper. Avoid damaging the thermosensitive printer head. Unless replacing the recorder paper or troubleshooting, do not leave the recorder door open.

- Removing Paper Jam

When the recorder functions or sounds improperly, open the recorder door to check whether paper jam exists. If yes, re-install the recorder paper.

- Recorder Status Message (Technical Alarm)

Message	Cause	Alarm Level	Remedy
RECORDER HEAD HOT	The thermal terminal is too hot.	Low	Stop operation
REC HEAD IN WRONG POS.	The thermal head is not in recording place.	Low	Push down the switch on the left axis of the recorder.
RECORDER OUT OF PAPER	Record paper runs out.	Low	Insert a new roll of record paper.
RECORDER COMM ERR	Operating status error	Low	Reset the recorder.
RECORDER PAPER JAM	Recording continuously for more than 30m	Low	Re-insert paper.
RECORDER INITIALIZING	The recorder is in initialization process.	Low	Wait for the completion of initialization
TOO MANY REC TASKS	Too many alarm events take place simultaneously.	Low	Send recording order after a while.
RECORDER PAPER W.P.	The paper is in wrong position.	Low	Insert the record paper again.
RECORDER BUSY	In the status of printing out	Low	Wait for the completion of printing out
REC NOT AVAILABLE	Recorder stops working.	Low	Give recording order after the recorder restores to the normal status or the failure is removed.
RECORDER VLT HIGH	The voltage of the recorder is too high.	Low	Stop recording until the recorder restores normal status.
RECORDER VLT LOW	The voltage of the recorder is too low.	Low	Stop recording until the recorder restores normal status.
RECORDER S. COMM ERR	Unrecoverable serial port communication error.	Low	Shut down the monitor and re-start it again.
RECORDER SELFTEST ERR	Possibly caused by the RAM, ROM, CPU or WATCHDOG	Low	Reset the recorder.
RECORDER INIT ERR	Error occurs during initialization	Low	Shutdown and re-start
RECORDER INIT ERR1	Error occurs during initialization	Low	Shutdown and re-start
RECORDER INIT ERR2	Error occurs during initialization	Low	Shutdown and re-start
RECORDER INIT ERR3	Error occurs during initialization	Low	Shutdown and re-start
RECORDER INIT ERR4	Error occurs during	Low	Shutdown and re-start

	initialization		
RECORDER INIT ERR7	Error occurs during initialization	Low	Shutdown and re-start
RECORDER INIT ERR8	Error occurs during initialization	Low	Shutdown and re-start

After restarting the monitor, if error still exists, contact our service engineers please.

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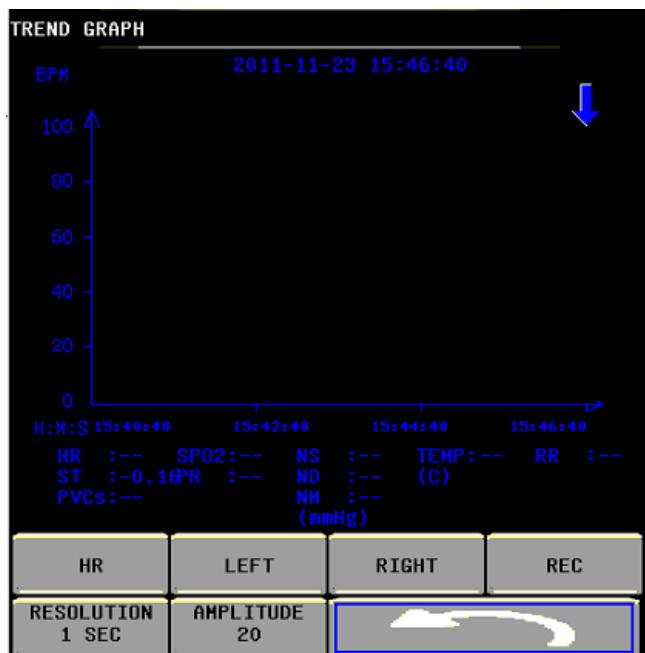
Chapter 8 Recall

The monitor provides 480-hour trend data of all parameters, storage of 2400 groups of NIBP measurement results and 72 alarm events. All these data can be output through recorder. By using SD card, the trend data and 72-hour ECG waveform can be reviewed. This chapter gives detailed instruction for reviewing these data.

8.1 Trend Graph

- The latest 1-hour trend is displayed in a resolution of every 1 or 5 seconds;
- The latest 480-hour trend is displayed in a resolution of every 1, 5 or 10 minutes;

Select "TREND GRAPH" in the "TREND RECALL" menu to pop up the following menu.

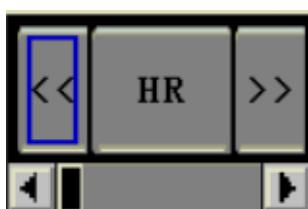


TREND GRAPH Menu

The y-axis stands for measured value and x-axis stands for time. The symbol "" in above figure is the cursor of trend graph. The value that the cursor points to, is displayed under the trend graph, and its corresponding time is displayed above the trend. Other trends except NIBP trend are displayed in continuous curves. In NIBP trend graph, the symbol "*" represents the coordinate of the NIBP value.

■ To select trend graph of a specific parameter

Pick the white rectangle in the bottom of the menu, (the second selection of the upper line) and a sub-menu will pop up, you can select the parameter you want to observe from the following sub-menu.



Parameter Select

■ To select 1-hour or 480-hour trend graph

Pick RESOLUTION item by using the cursor, choose 1 s/5 s for 1-hour trend graph and 1min/5 min/10 min for 480-hour trend graph.

■ **To view earlier or later trend curves**

Select "LEFT" to observe the later trend curve, "RIGHT" to observe the earlier trend curve.

■ **To change the display scale**

Pick the "AMPLITUDE" button to adjust the y-axis scale and thus change the trend curve in proportion. The value beyond maximum value will be represented by the maximum value.

■ **To obtain trend data of a specific time**

Pick "CURSOR" to make  movable, drag it left and right horizontally, and the time to which the cursor points will change as the knob is turned. Parameter at this time is displayed below the x-axis.

■ **To print out the trend curve**

Press "REC" button to print out the trend curve of current selected parameter through the recorder.

■ **Event marks on the trend data**

If an event is marked A, B, C, or D, then on the trend graph, the event type (A, B, C, or D) will be displayed at the point corresponding to the moment of marking.

■ **Operation example**

To view the NIBP trend graph of the lastest 1 hour:

- 1) Pick  functional key at the bottom of the screen, or open "MAIN MENU" and then pick "TREND RECALL".
- 2) Pick TREND GRAPH;
- 3) Select the second item, then select "NIBP";
- 4) Select "RESOLUTION", then select "1 second" or "5 second";
- 5) Pick the [AMPLITUDE] button select a amplitude in the sub-menu to view changes of the trend graph time and trend curve.
- 6) Stop at the time segment to be observed, Pick "AMPLITUDE" button to adjust the display scale if necessary.
- 7) For measurement result of a specific time, the arrow  will be operable, press on the arrow and drag it to the point, corresponding time and value will display on above and below respectively.
- 8) Pick  button to return to "TREND RECALL" menu.

8.2 Trend Table

The latest 480-trend table data can be displayed at every 1 min, 5 min, 10 min, 30 min, or 60 min.

Pick TREND TABLE in the TREND MENU to call up the following menu:

TREND TABLE				
TIME	HR (BPM)	PVCs (/min)	ST (mV)	>
(19)09:51	80	0	0.05	
(19)09:50	80	0	0.05	
(19)09:49	80	0	0.05	
(19)09:48	80	0	0.05	
(19)09:47	80	0	0.05	
(19)09:46	80	0	0.05	
(19)09:45	80	0	0.05	
(19)09:44	80	0	0.05	
(19)09:43	80	0	0.05	
(19)09:42	80	0	0.05	

RESOLUTION	1 MIN	LEFT	RIGHT
	PgUp	PgDn	REC

TREND TABLE Menu

Time corresponding to each group of trend data is displayed at the leftmost list with date in brackets. Marked events are listed under the "EVENT" corresponding to the time of marking. Trend data of all parameter is divided into 6 groups.

HR, PVCs

ST1, ST2

SpO₂, PR

RR

TEMP

NIBP (S/M/D)

NIBP trend data presents different specificity. A certain NIBP measuring time displays below the TEST AT item, as well as the measurement value. For more than one measurement in one time, it can display only one group, and mark a "*" on the MORE to indicate two and above measurement results.

■ To select trend table of a specific resolution

Pick the white rectangle after "RESOLUTION" item and select different items to change the time interval of trend data.

■ To view earlier or later trend data

Select "PgUp" or "PgDn" to observe earlier or later trend data.

■ To view trend data of different parameter

Pick L-RIGHT to select one from the 6 groups of parameters. A ">" by the rightmost item indicates following page available. And "<" by the leftmost item indicates previous page available.

■ Event marks on the trend data

If an event is marked A, B, C, or D, the event type (A, B, C, or D) will be displayed at corresponding time in the trend table.

■ Operation example

To view the NIBP trend table:

- 1) Pick  functional key-stroke at the bottom of the screen, or open "MAIN MENU" and then pick "TREND RECALL".
- 2) Pick "TREND TABLE".

-
- 3) Pick "RIGHT" button until switch to NIBP page.
 - 4) Pick the white rectangle after "ESOLUTION" select requested time interval.
 - 5) Pick "PgUp" or "PgDn" to view NIBP trend data of different time.
 - 6) For printout of trend table, pick REC to start report printing of all trend data including NIBP of this time span.

- 7) Pick  item to return to "TREND RECALL" menu.

8.3 NIBP recall

The monitor can review the latest 2400 groups of NIBP measurement data.

Pick NIBP RECALL in the TREND MENU to invoke the result and time of the latest 10 measurements. Data is listed chronologically from the latest to the earliest. One screen can display 10 measurement data, select “PgUp” or “PgDn” to observe the later or earlier data. Pick REC to print out all measurement data of NIBP RECALL.

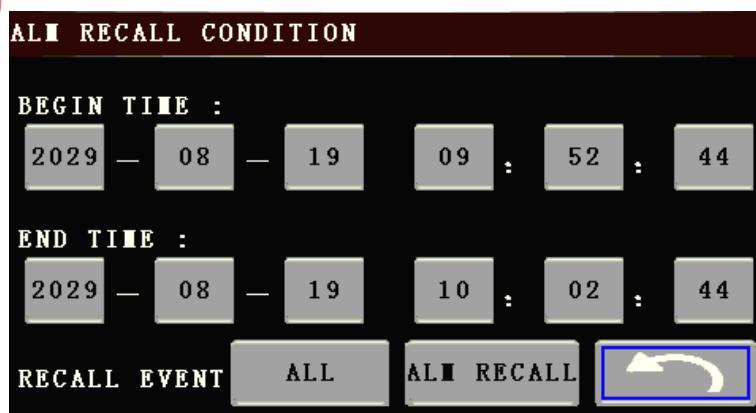


NIBP RECALL					
NO.	NS	NM	ND	TIME	
1	121	80	71	11:44:40	03-01-2010
2	117	75	61	11:46:03	03-01-2010

NIBP RECAL

8.4 Alarm recall

Select “TREND RECALL” in “MAIN MENU” interface to enter its sub-menu, then select “ALM RECALL”, the alarm recall conditions can be set here, including:



ALM RECALL CONDITION										
BEGIN TIME :										
2029	-	08	-	19	:	09	:	52	:	44
END TIME :										
2029	-	08	-	19	:	10	:	02	:	44
RECALL EVENT		ALL		ALM RECALL						

ALARM RECALL TIME Menu

■ Start and End time of review

The user may select the start time of review in the items below "BEGIN TIME". Then the user may select the end time of review in the items below "END TIME". Two selections are available: current time and the user-defined time.

■ Alarm recall event

Pick the button at the right of [RECALL EVENT], the user can select the parameter whose alarm events he wants to review from a sub-menu. The selections include ALL (alarm events of all parameters), ECG, SpO₂, NIBP, RESP, TEMP.

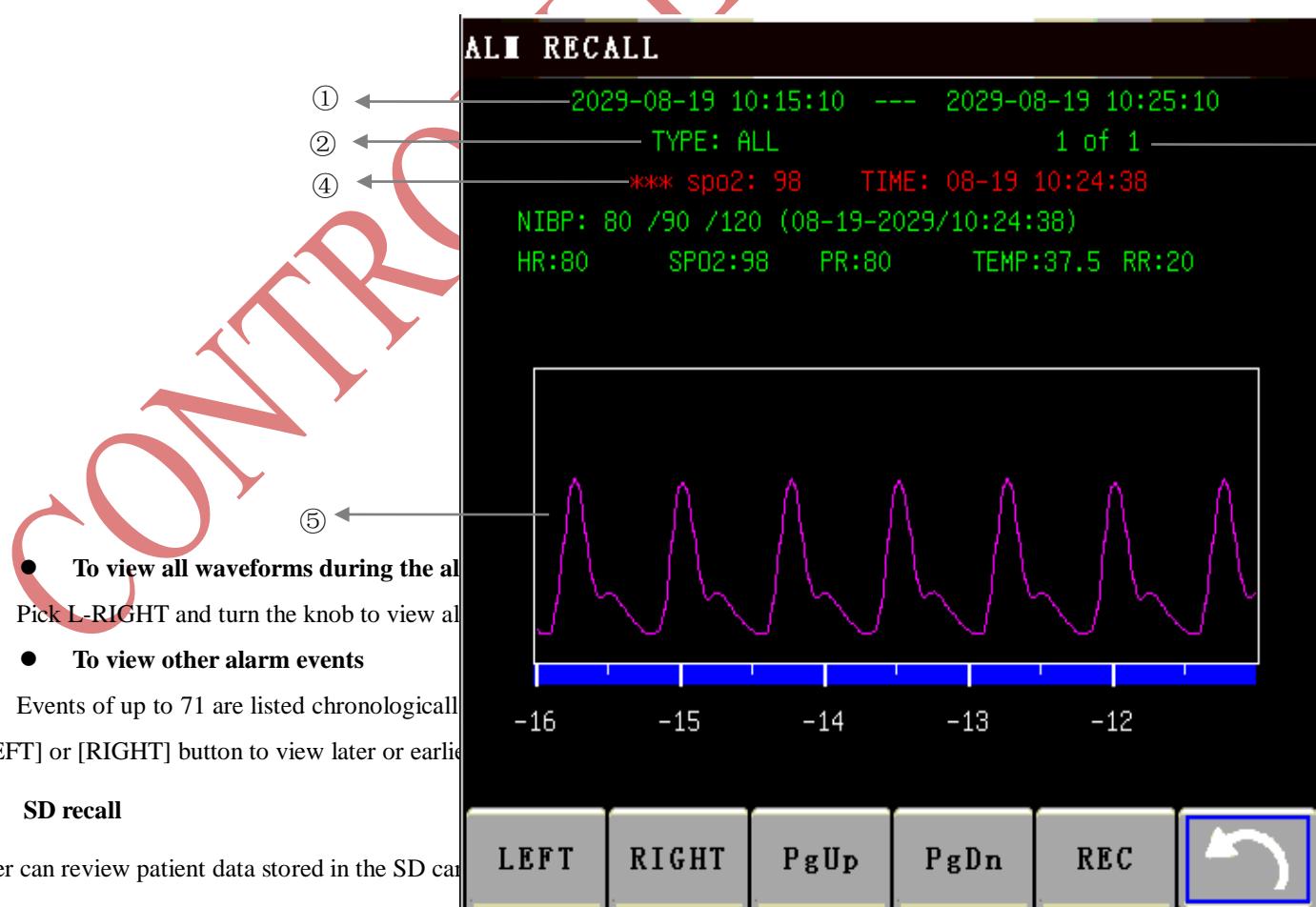
After finishing the setup of all review conditions, press the "ALM RECALL" button to access "ALM RECALL" menu.



ALARM RECALL EVENT

■ ALARM RECALL

- ① Time span (Format: year-month-day hour: minute---year-month-day hour: minute).
- ② Event type.
- ③ Serial number (Format: NO. xx of XX).
- ④ The value at the time of alarm. NIBP result is with time.
- ⑤ One 8/16/32-second waveform.



An empty SD card with at least 2G capacity is needed. The SD card mounted on the monitor could memory trend data (parameters including: HR, PVCs, ST1, SpO₂, PR, RR, T1, T2, TD, NIBP) and 72-hour ECG waveform. The trend data

is stored per 1 minute.

NOTE:

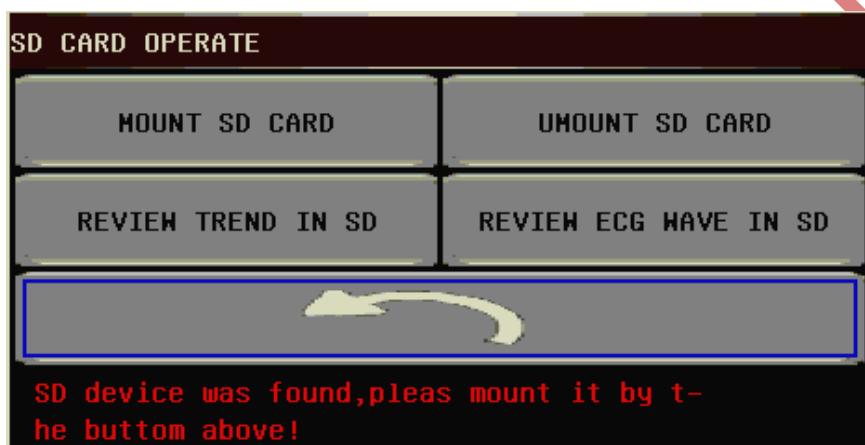
- Please first set the patient's information correctly before inserting SD card.
- If different patient's data need to be saved in one SD card, you should unmount the SD card first, and then modify patient's information. Make sure that the patient number is different.

1) Enter SD OPERATE menu

Select "MENU"→"MAINTAIN"→"SD OPERATE", then you could enter the SD OPERATE menu.

2) Insert SD card

If SD card has been inserted and works normally, the prompt "SD device was found, please mount it by the button above!" appears.



NOTE:

- If information "SD device wasn't found, please enter SD card!" appears, you should exit "SD OPERATE" menu, check if SD card or USB interface is normal. If the problem still exists, reboot the monitor.

3) Mount SD card

If the monitor has found the SD card, select "MOUNT DEVICE" item, the system will display messages to indicate whether the SD card has been mounted successfully.



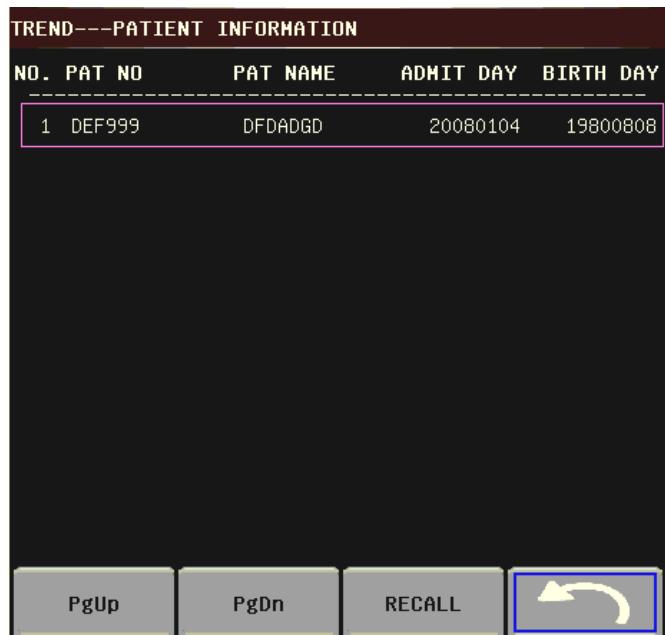
SD Card Operate

NOTE:

- Data can be reviewed only after SD card has been mounted successfully for 90 seconds . Otherwise the two buttons "REVIEW TREND" and "REVIEW ECGWAVE" are invalid.

4) Review trend**■ Review trend****①Select "REVIEW TREND IN SD" item in SD OPERATE menu**

The following menu will pop up. In this menu, you can select any patient you want to review(click it again or click "REVIEW" after selecting the patient).



The items from left to right in this menu are No., patient No., patient name, admission date and birth date. The information is displayed according to the content set in patient setup.

The buttons at the bottom of menu includes:

- ◆ PgUp/PgDn: observe patient lists of other page.
- ◆ RECALL: press this button to call up the patient trend information.

②Reading trend data's information

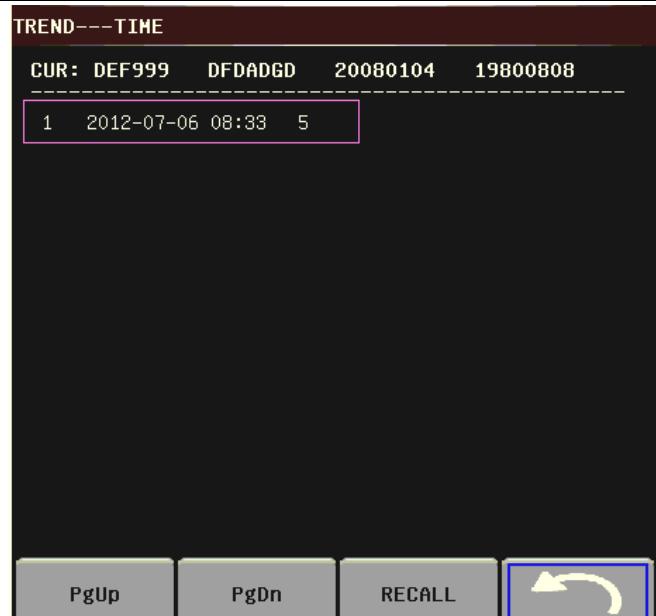
The menu displays the trend data's information according to the selected patient.

The header, from left to right is:

- ◆ Patient No.
- ◆ Patient's name
- ◆ Admission date
- ◆ Birth date

The content of list, from left to right is:

- ◆ The list number
- ◆ The time that the patient data was reviewed.
- ◆ The size of data having been saved to the time that the patient data was reviewed.



SD Card Information

③Review trend data

Select an item in above menu, then click the selected item again or press "REVIEW" button to enter the trend review interface, the trend data will be displayed in the form of list. The resolution is 1 minute.

REVIEW TREND			
PAT NO	PAT NAME	DATE	COUNT
DEF999	DFDADGD	2012-07-06	1/1
TIME	HR (BPM)	PVCS (/MIN)	ST (mV)
(06)08:33	80	0	-.--
(06)08:32	80	0	-.--
(06)08:28	80	0	-.--
(06)08:27	80	0	-.--
(06)08:26	80	0	-.--

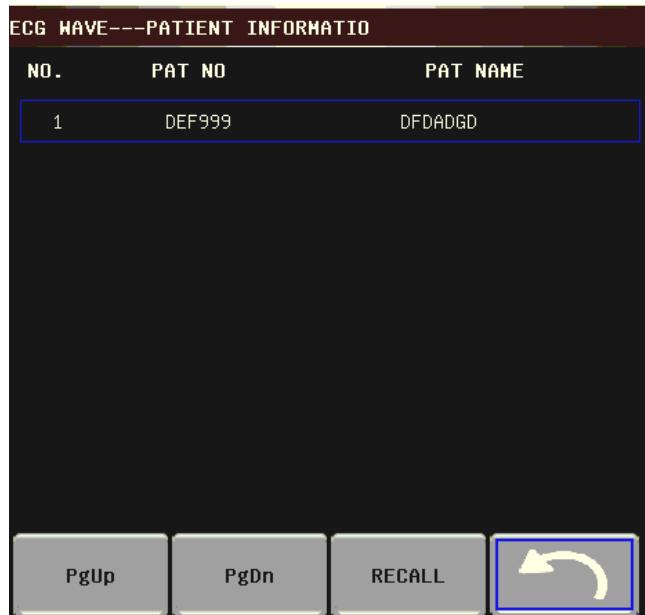
Trend Data Review

The buttons are:

- ◆ PgUp/PgDn: to view trend data of different time.
- ◆ LEFT/ RIGHT: to view trend data of different parameter.
- ◆ REC: to print current list.

■ Review ECG waveform

①Select the "REVIEW ECG WAVE IN SD" button in SD OPERATE menu, then choose a specific patient to review.



②Select time span you want to review

ECG data is saved in many different files. It need save ECG data in a new file per half an hour. For example, "2012-07-03 13:27" represents ECG file name, it also indicates the starting time that the file is saved.

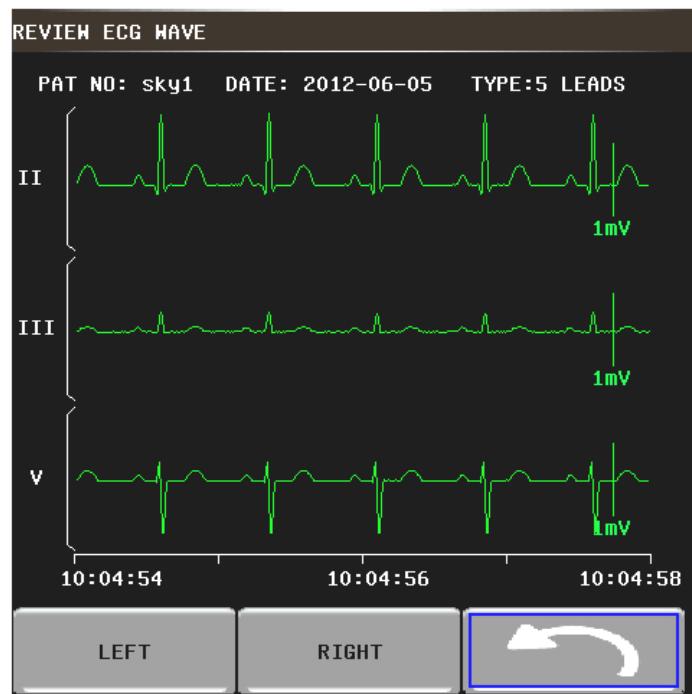
Select the time span: To review the ECG waveform about "2012-07-03 13:27"

- ◆ Click "1 2012-07-03 13:27" on the screen.
- ◆ Click "1 2012-07-03 13:27" on the screen again or press "REVIEW".



③Review ECG waveform

- ◆ The time span of one window is 5s.
- ◆ The window can display 3 channels ECG waveform. When the lead type is "5 LEADS", it displays ECG II, ECG III and ECG V.

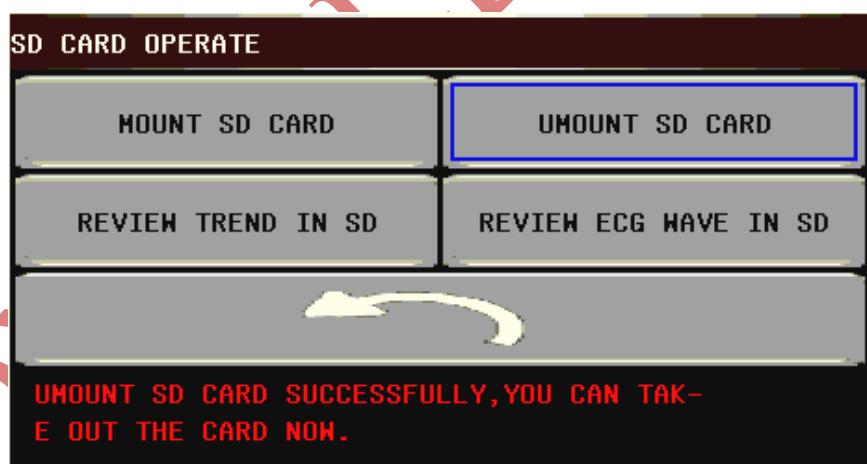


ECG Review For 5-Lead

- ◆ When the lead type is "3 LEADS", it can displays only one channel waveform. The ECG lead is the same with the one displayed on the monitor.

5) Unmount SD card

Enter "SD OPERATE" menu, press "UMOUNT SD CARD". You can take out SD card only when the system displays the prompt "UMOUNT SD CARD SUCCESSFULLY, YOU CAN TAKE OUT THE CARD NOW."



SD Card Operate

Chapter 9 Drug Calculation and Titration Table

This Portable Patient Monitor provides drug calculation and titration table display functions for fifteen drugs and outputs the content of titration table on the recorder.

9.1 Drug Calculation

The drug calculations that can be performed by the system are AMINOPHYLLINE, DOBUTAMINE, DOPAMINE, EPINEPHRINE, HEPARIN, ISUPREL, LIDOCAINE, NIPRIDE, NITROGLYCERIN and PITOCIN. Besides DRUG A, DRUG B, DRUG C, DRUG D and DRUG E are also provided to flexibly replace any of the drugs.

Click “ADDIT FUNC” in “MAIN MENU” interface to enter its sub-menu, then click “DRUG CALCULATE” to enter its sub-menu shown as the following figure.

DRUG CALC -- ADULT	
DRUG NAME	DRUG A
PAT WEIGHT	154.0
DRUG AMOUNT	400.00 mg
DRUG VOLUME	250.00 ml
CONCENTRAT	1600.00 mcg/ml
DOSE/min	2500.00 mcg
DOSE/hr	150.00 mg
DOSE/kg/min	16.23 mcg
DOSE/kg/hr	974.03 mcg
INF RATE	93.75 ml/hr
DRIP RATE	31.25 GTT/min
DROP SIZE	20.00 GTT/ml

The following formulas are applied for dose calculation:

$$\text{Concentration} = \text{Amount} / \text{Volume}$$

$$\text{INF Rate} = \text{Dose}/\text{Concentration}$$

$$\text{Duration} = \text{Amount} / \text{Dose}$$

$$\text{Dose} = \text{Rate} \times \text{Concentration}$$

Operating method:

In the Drug Calculation window, the operator should first select the name of the drug to be calculated, and then confirm the patient weight. Afterwards, the operator should also enter other known values.

Turn the knob to move the cursor to each calculation item in the formula, press the knob and turn it to select a value.

When the calculated value is selected, the result of other items will be displayed correspondingly. Each calculation item has a range limit, and if the result is out of range, the system will display "----".

NOTE:

- For the drug calculation, the prerequisite is that the operator must first of all enter the patient weight and

drug name. Values given by the system at the beginning are a group of random initial values, which cannot be used as the calculation reference. Instead, a new group of values suitable for the patient should be entered according to doctor's advice.

- Each drug has its fixed unit or unit series. Operator must select the proper unit following the doctor's instruction. The unit will automatically adjust itself in its unit series according to the input value. If the result expressed by this unit exceeds the range, the system will display "---".
- After entering a value, a conspicuous prompt will appear in the menu warning the operator to confirm the correctness of the entered value. The correctness of input value is the guarantee for the reliability and safety of the calculated results.
- In neonate mode, Drip Rate and Drop Size items are disabled.
- For each entered value, the system will always give a dialog box asking for user's confirmation. You must be careful when answering each box. The calculated result is reliable only when the entered values are correct.

- Select the drug name: Turn the knob to pick the DRUG NAME item. You may select the drug name in the pull-down list, including AMINOPHYLLINE, DOBUTAMINE, DOPAMINE, EPINEPHRINE, HEPARIN, ISUPREL, LIDOCAINE, NIPRIDE, NITROGLYCERIN, PITOCIN, Drug A, Drug B, Drug C, Drug D and Drug E. Calculation for only one type can be generated each time.

NOTE:

- Drug A/B/C/D/E are only codes for drugs instead of their real names. The units for these five drugs are fixed. The operator may select the appropriate units according to the convention of using these drugs. The rules for expressing the units are:
 - "mg" series units are fixedly used for drug A, B and C: g, mg, mcg.
 - "unit" series units are fixedly used for drug D: unit, k unit, m unit.
 - "mEq" is fixedly used for drug E.

- Patient weight: After accessing the DRUG CALC window, the operator should enter the patient weight into the first or the second item. The entered weight will be used as the independent data only for the calculation of drug concentration.

NOTE:

- This drug calculation function acts only as a calculator. Information in this interface may not related to the patient being currently monitored. That means the patient weight in Drug Calculation menu and the data in Patient Information menu are independent from each other. Therefore, if the Weight in Patient Information changes, the value in Drug Calculation will not be affected.

9.2 Titration Table

Select "DRUG NAME" item in DRUG CALCULATE menu, confirm your selection, then select "TITRATION TABLE" to enter the titration table interface.

TITRATION -- DRUG A								
AMOUNT	160.00	mg	VOLUME	100.00	ml	DOSE/min	800.00	mcg
INF RATE	30.00	ml/hr	WEIGHT	6.80	KG	DRIP RATE	---.--- GTT/min	
DOSE	INF RATE	DOSE	INF RATE	DOSE	INF RATE	DOSE	INF RATE	DOSE
0.00	0.00	10.00	0.38	20.00	0.75	30.00	1.01	50.00
1.00	0.04	11.00	0.41	21.00	0.79	31.00	1.05	51.00
2.00	0.08	12.00	0.45	22.00	0.83	32.00	1.09	52.00
3.00	0.11	13.00	0.49	23.00	0.86	33.00	1.13	53.00
4.00	0.15	14.00	0.53	24.00	0.90	34.00	1.17	54.00
5.00	0.19	15.00	0.56	25.00	0.94	35.00	1.21	55.00
6.00	0.23	16.00	0.60	26.00	0.98	36.00	1.25	56.00
7.00	0.26	17.00	0.64	27.00	1.01	37.00	1.29	57.00
8.00	0.30	18.00	0.68	28.00	1.05	38.00	1.33	58.00
9.00	0.34	19.00	0.71	29.00	1.09	39.00	1.37	59.00

BASIC **DOSE** **DOSE TYPE** **DOSE/min**
PAGE UP **PAGE DOWN** **REC** **STEP 1**

TITRATION

- Method to operate the titration table:
1. In the TITRATION table, pick the white rectangle at the right side of [BASIC] item. Select either INF RATE or DOSE or DRIP RATE in sub-menu.
 2. Pick [STEP] item, select step in the sub-menu. 1 ~ 10 are available for selection with the increment being 1.
 3. Pick the white rectangle at the right side of [DOSE TYPE] item. Select the unit in the pop-up sub-menu.
 4. Use [PAGE UP] and [PAGE DOWN] item in the table to view the data in previous or following pages.
 5. Pick REC item, the recorder prints out the data displayed in the current titration table.
 6. Pick item to return to DRUG CALCULATE menu.

Total amount, dose, volume, flow-rate, drop rate and patient weight and drug name display on the top of the titration table. Meaning of each English identifier is:

AMOUNT: drug amount

VOLUME: liquid volume

DOSE/min: drug dose

INF RATE: inf rate

DRIP RATE: drip rate

WEIGHT: patient weight

Chapter 10 ECG Monitoring

10.1 Introduction

The ECG monitoring produces a continuous waveform of the patient's cardiac electric activity to enable an accurate assessment of patient's current physiological state. Only proper connection of the ECG cables can ensure satisfactory measurement. The monitor displays 2-channel ECG waveforms at the same time in normal working, and provides 3/5-lead monitoring, ST segment analysis and arrhythmia analysis.

- The patient cable consists of 2 parts;
 - The cable that connects to the monitor;
 - The lead set that connects to the patient.
- For requested lead, you may choose the lead type above ECG waveform.
- The monitor displays the Heart Rate (HR), ST segment and Arrhythmia analysis.
- All parameters above can be set as alarm parameters.

NOTE:

- In the default settings of the monitor, the ECG waveforms are the top two waveforms displayed in the waveform area.

10.2 Safety information

WARNING

- Do not touch the patient, table nearby, or the equipment during defibrillation.
- Use only the ECG cables and electrodes provided by our company for monitoring.
- When connecting the cables and electrodes, please do make sure that the cables and electrodes are not in contact with any conductive part or the earth, especially all the ECG electrodes, including neutral electrodes are securely attached to the patient. Do not let them contact with any conductive part or the ground.
- Check the skin attached with ECG electrode patches for irritation everyday. If there is a sign of allergies, replace the electrodes every 24 hours or change the sites.
- Before starting the monitoring, inspect whether the lead works normally. Unplug the ECG cable from the socket, the screen will display the error message "ECG LEAD OFF" and the audible alarm will be activated.
- To achieve a successful defibrillation, it is required that all patches related to electrodes should be correctly attached.

NOTE:

- Please use defibrillation proof ECG cable during defibrillation.
- Interference from a non-grounded instrument near the patient and ESU interference can cause inaccuracy of the waveform.
- When a ECG device is unable to work, such as "ECG module communication stopped", "ECG module communication error" or "ECG module initialization error" appears, the monitor will stop monitoring automatically, and the prompt system alarm, which is a high-level alarm.

-
- For protecting environment, used electrodes must be recycled or disposed properly.

10.3 Monitoring Procedure

10.3.1 Preparation

- 1) Prepare the patient's skin prior to placing the electrodes.
 - The skin is a poor conductor of electricity, therefore preparation of the patient's skin is important to facilitate good contact between electrodes and skin.
 - Shave hair from the sites where electrode patches attach to, if necessary.
 - Wash sites thoroughly with soap and water. (Never use ether or pure alcohol, because this increases skin impedance).
 - Rub the skin briskly to increase capillary blood flow in the tissues and remove skin scurf and grease.
 - Before installing the electrodes, let the skin dry completely.
- 2) Attach clip or snap to electrodes prior to placement.
- 3) Install the electrodes on the patient. Before attaching, apply some conductive paste on the skin if the electrode does not contain conductive paste itself.
- 4) Connect the electrode lead to the patient cable.
- 5) Make sure the monitor is ready with power supply.

10.3.2 Choose Lead Type

1. Select the ECG parameter area, enter the ECG setup menu.
2. Set the "LESD TYPE" to "3 LEADS" or "5 LEADS" according to the lead type you applied.

10.3.3 Installing ECG lead

The following description takes America standards as examples.

NOTE:

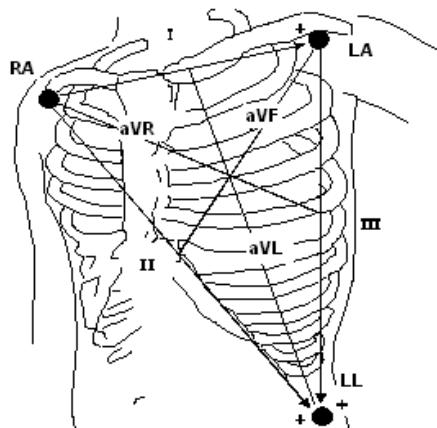
- The following table gives the corresponding lead names used in Europe and America Standards. (Lead name is represented by R, L, N, F, C and C1~C6 respectively in Europe Standard, while corresponding lead name in America Standard is RA, LA, RL, LL, V and V1~V6.)

America Stand		Europe Standard	
Lead name	Color	Lead name	Color
RA	White	R	Red
LA	Black	L	Yellow
LL	Red	F	Green
RL	Green	N	Black
V	Brown	C	White
V1	Brown/Red	C1	White/Red
V2	Brown/Yellow	C2	White/Yellow
V3	Brown/Green	C3	White/Green
V4	Brown/Blue	C4	White/Brown
V5	Brown/Orange	C5	White/Black

The 3-lead

The placement of 3-lead electrodes is shown as below:

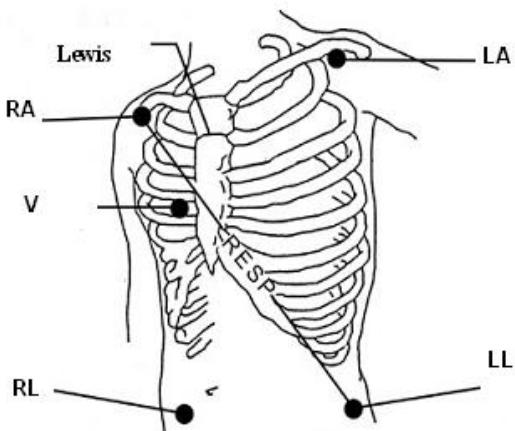
- RA (right arm): under the clavicle, near the right shoulder
- LA (left arm): under the clavicle, near the left shoulder
- LL (left leg): left lower quadrant



The 5-lead

The placement of 5-lead electrodes is shown as below:

- RA (right arm): under the clavicle, near the right shoulder
- LA (left arm): under the clavicle, near the left shoulder
- RL (right leg): right lower quadrant
- LL (left leg): left lower quadrant
- V (chest): on the chest



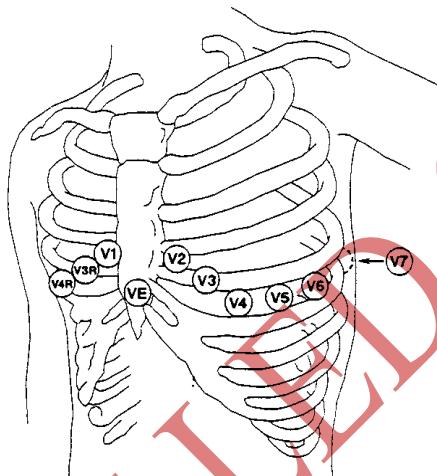
NOTE:

- To ensure patient safety, all leads must be attached to the patient.

For 5-lead set, attach the chest electrode (V) to one of the indicated positions as below:

- V1: On the 4th intercostal space at the right sterna margin.

-
- V2: On the 4th intercostal space at the left sterna margin.
 - V3: Midway between V2 and V4 electrodes.
 - V4: On the 5th intercostal space at the left clavicular line.
 - V5: On the left anterior axillary line, horizontal with V4 electrode.
 - V6: On the left middle axillary line, horizontal with V4 electrode.
 - V3R-V7R: On the right side of the chest in positions corresponding to those on the left.
 - VE: Over the xiphoid position. For the placement of V-leads on the back, it should be attached on one of the following sites.
 - V7 : On the 5th intercostal space at the left posterior axillary line of back.
 - V7R: On the 5th intercostal space at the right posterior axillary line of back.



Recommended ECG Lead Placement for Surgical Patients

The placing of the ECG leads will depend on the type of surgery that is being performed. For example, with open chest surgery the electrodes may be placed laterally on the chest or on the back. In the operating room, artifacts can sometimes affect the ECG waveform due to the use of ES (Electrosurgery) equipment. To help reduce this you can place the electrodes on the right and left shoulders, the right and left sides near the stomach, and the chest lead on the left side of mid-chest. Avoid placing the electrodes on the upper arms, otherwise the ECG waveform will be too small.

WARNING

- When using electrosurgery equipment, leads should be placed in a position in equal distance from electrotome and the grounding plate to avoid cautery. Electrosurgery equipment wire and ECG cable must not be tangled up.
 - When using Electrosurgery equipment, never place an electrode near the grounding of the electrosurgery device, otherwise there will be a great interference with the ECG signal.
 - When using the device with high-frequency electrosurgical equipment, it can be restored to the previous operating mode within 10s after the high-frequency signal and high-frequency electromagnetic field are eliminated, without losing any data that has been permanently stored.
 - When the monitor is connected to a defibrillator and other high-frequency devices, it is recommended to use anti-defibrillation ECG leads, otherwise it may cause burns to the patient.
-

-
- When the monitor is used with a defibrillator, the operator should avoid contact with the patient or bed, and the defibrillation electrode should not touch the electrode of the monitor directly, for doing so may generate sparks then causing device damage or patient injury.
-

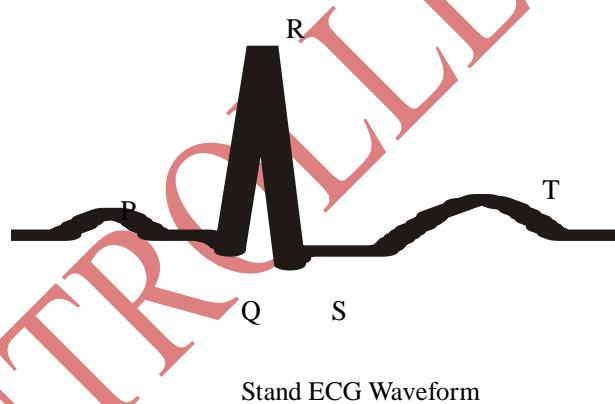
NOTE:

- If a ECG waveform is not accurate, while the electrodes are correctly attached, try to change the lead.
- Interference from a non-grounded instrument near the patient and ESU interference can cause inaccuracy of the waveform.
- The transient effect of mains isolation monitor may be similar to the ECG waveform, so it may suppress the HR alarm.

A good signal should be:

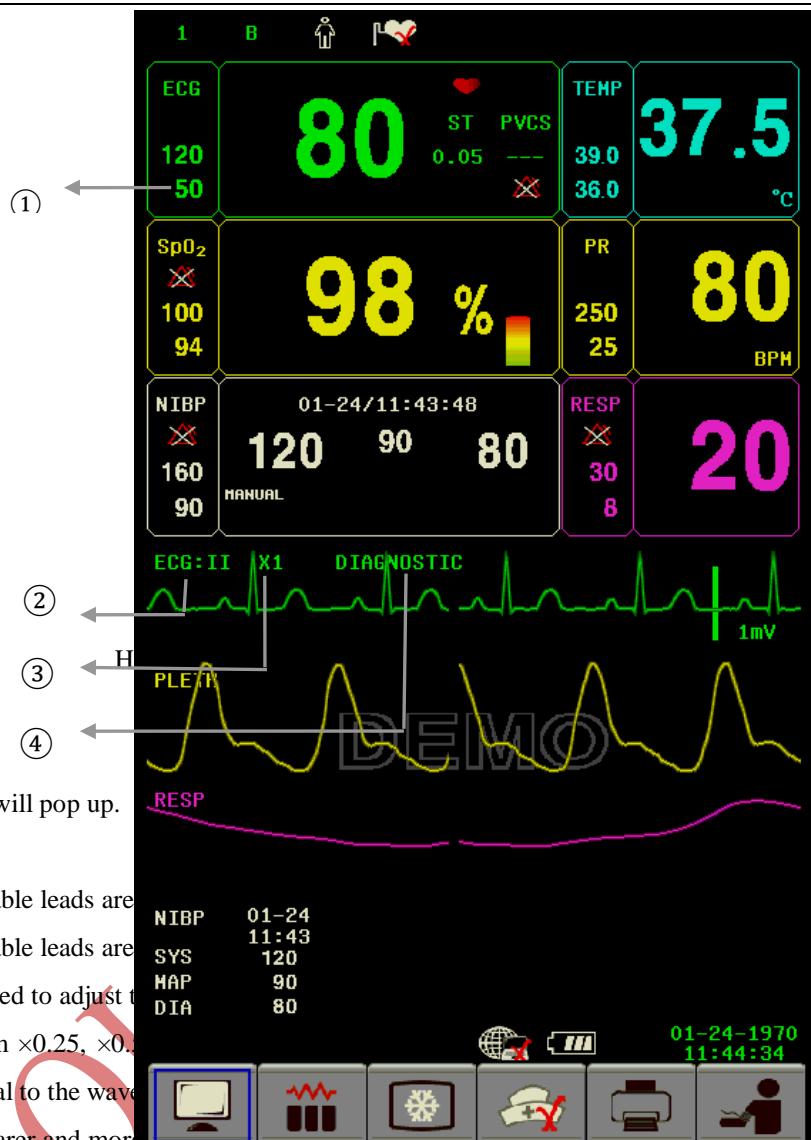
- Tall and narrow with no notches.
- With tall R-wave completely above or below the baseline.
- With pacemaker signal no higher than R-wave height.
- With T-wave less than one-third of the R-wave height.
- With P-wave much smaller than the T-wave.

To obtain a 1 mv calibrated ECG wave, the ECG should be calibrated. A message "CAL, can't monitor!" prompts on the screen.



10.4 ECG Screen Hot Keys

The following figure is an interface of 5-lead monitoring, only for reference.



WARNING

- Only in Diagnostic mode, the system can provide non-processed real signals. In Monitor or Surgery mode, ECG waveforms may have distortion of different extent. In either of the latter two modes, the system can only show the basic ECG, the results of ST analysis may also be greatly affected. In Surgery mode, results of ARR analysis may be somewhat affected. Therefore, it is suggested that in the environment having relative small interference, you'd better monitor a patient in Diagnostic mode.

NOTE:

- When the input signals are too large, the peak of the waveform may not able to be displayed. In this case user could manually change the gain setup of ECG waveform according to the actual waveform so as to avoid the occurrence of the unfavorable phenomena.

10.5 ECG setup

Click the ECG hot keys in parameter area, then press the knob to enter “ECG SETUP” interface.



ECG SETUP

- ◆ HR ALM: pick "ON" to enable alarm prompt and data record during the heart rate alarm; pick "OFF" to disable the alarm function, and there will be a  in parameter area.
- ◆ ALM REC: pick "ON" to enable report printing upon ECG alarm.
- ◆ ALM LEV: selectable from HIGH, MED, LOW. Level HIGH represents the most serious case.
- ◆ FILTER: DIAGNOSIS /MONITOR/SURGERY.
- ◆ TYPE: 5 LEADS or 3 LEADS.
- ◆ ALM HI: used to set up the upper limit of ECG alarm.
- ◆ ALM LOW: used to set up the lower limit of ECG alarm.

ECG alarm is activated when the heart rate exceeds set ALM HI value or falls below ALM LOW value.

HR alarm limits:

	Max. ALM HI	Min. ALM LO	Step
ADU	300	15	1
PED/NEO	350	15	1

NOTE:

- **ECG alarm is activated when the heart rate exceeds ALM HI value or falls below ALM LO value.**
- Please set the alarm limits according to clinical condition of individual patient.
- The setup of HR alarm limits is very important in monitoring process. The upper limit should not too high. Considering the factors of variability, the upper limit of HR alarm should 20 beats/min higher than the patient's heart rate at most.
 - SPEED: Available options for ECG SWEEP are 12.5 mm/s, 25.0 mm/s, and 50.0 mm/s.
 - NOTCH: ON/OFF
 - BAND SET: OFF, 1~7
 - ST ANALYSIS

Pick this item to enter ST SETUP menu, the detailed information about the menu is to be discussed in the following section.

■ ARR. ANALYSIS

Pick this item to access ARR ANALYSIS SETUP menu, the detailed information about the menu is to be discussed in the following section.

■ OTHER SETUP



ECG OTHER SETUP

In the sub-menu, following functions are available:

- ◆ ECG CAL: pick this item to start calibrating ECG. The method to end calibrating: re-select this button in the menu or change the lead name on the screen.
- ◆ ADJUST WAVE POS:adjust ECG position.



ECG WAVE ADJUST

- ◆ Pick [WAVE UP]: the baseline of ECG waveform will move upward.
- ◆ Pick [WAVE DOWN]: the baseline of ECG waveform will move downward.
- ◆ Pick [DEF POS]: the baseline of ECG waveform will move to the default position.
- ◆ Pick [EXIT]: will return to the "ECG OTHER SETUP" menu.
- ◆ ECG GANI: $\times 0.25, \times 0.5, \times 1, \times 2$.
- ◆ LEAD: pick this item to choose a lead displayed in wave areas.
- ◆ DEFAULT: pick this item to access the ECG DEFAULT CONFIG dialog box, in which user may select either the DEFAULT FACTORY CONFIG or the DEFAULT USER CONFIG. After selecting one item and exiting the dialog box, the system will pop up a dialog box asking for user's confirmation.

10.6 ECG Alarm and Prompt Message

Alarms occurring in the process of ECG measurement contain two types: physiological alarm and technical alarm. Prompt messages may also appear in the mean time. For the audio and visual features during the appearance of these alarms and prompt messages, please refer to the related description in *Chapter 5 Alarm*. In the screen, physiological alarms and prompt messages (general alarms) are displayed in the physiological alarm area of the monitor, while technical alarms, and prompt messages that unable to trigger alarms are displayed in the technical alarm area. This

section does not describe the alarm part about arrhythmia and ST analysis.

Among physiological alarms, those belonging to the type that the parameter has exceeded the limits may activate the recorder to automatically output the parameters and related measured waveforms when the alarms occur on the condition that the alarm record switch in related menu is On.

Tables below describe respectively the possible alarms those may occur during the measurement.

Physiological alarms:

Message	Cause	Alarm level
ECG LOST	No ECG signal of the patient is detected.	HIGH
HR TOO HIGH	HR measuring value is above the upper alarm limit	User-selectable
HR TOO LOW	HR measuring value is below the lower alarm limit	User-selectable

Technical alarms:

Message	Cause	Alarm level	Remedy
ECG LEAD OFF			
ECG V LEAD OFF or ECG C LEAD OFF			
ECG LL LEAD OFF or ECG F LEAD OFF	ECG electrodes fall off the skin or ECG cables fall off the monitor.	LOW	Make sure that all electrodes, leads and patient cables are properly connected.
ECG LA LEAD OFF or ECG L LEAD OFF			
ECG RA LEAD OFF or ECG R LEAD OFF			
ECG INIT ERR			
ECG INIT ERR1			
ECG INIT ERR2			
ECG INIT ERR3			
ECG INIT ERR4	ECG module failure	HIGH	Stop using measuring function provided by ECG module, notifies biomedical engineer or Our service staff.
ECG INIT ERR5			
ECG INIT ERR6			
ECG INIT ERR7			
ECG INIT ERR8			
ECG COMM STOP	Occasional communication failure	HIGH	If failure persists, notify biomedical engineer or Our service staff.
ECG COMM ERR	Occasional communication failure	HIGH	If failure persists, notify biomedical engineer or Our service staff.
HR ALM LMT ERR	Functional safety failure	HIGH	Stop using HR alarm function, notify biomedical engineer or Our service staff.
ECG NOISE	ECG measuring signal is greatly interfered.	LOW	Make sure the patient is quiet, the electrodes are properly connected and AC power system is well grounded.

Prompt messages (include general alerts):

Message	Cause	Alarm Level

HR EXCEED	HR measuring value exceeds the measurement range.	HIGH
-----------	---	------

10.7 ST Segment Monitoring

- The default setting for ST segment monitoring is "OFF", so the monitor will not process ST analysis. You can switch it to ON when necessary.
- The ST segment algorithm can measure the elevation or depression of the ST segment on the user-specified lead. The relevant ST measurement results are displayed numerically at the parameter areas ST1 and ST2. View the trend data displayed graphically and in tables under "TREND GRAPH" and "TREND TABLE" menu.
- Unit: mV
- Measurement range: -2.0~+2.0 mV
- Meaning of the value: positive means elevating, negative means depressing.

NOTE:

- When setting ST ANALYSIS on, the monitor will select "DIAGNOSTIC" mode. You can set it to "MONITOR" mode or "SURGERY" mode as required. However at this time ST value has been severely distorted.

10.7.1 ST alarm setup

Select "ECG ALARM MENU" item in the "ECG SETUP" menu, click "ST ANALYSE" to modify the following items:



ST SETUP

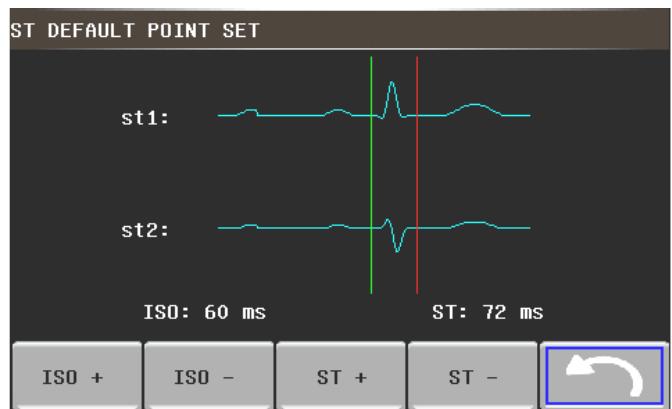
- ST ANALYSE: the switch for ST analysis. Set it to ON to activate the ST analysis or OFF to disable the ST analysis.
- ST ALM: pick "ON" to enable prompt message and data record during the ST analysis alarm; pick "OFF" to disable the alarm function, and there will be a beside parameter area ST1. ST alarm is activated when the result exceeds the upper limit of ST value or falls below the lower limit of ST value.
- ALM REC: "ON" means that the system will enable the recorder for alarm recording.
- ALM LEV: to set the ST alarm level. There are three selections: "HIGH", "MED" and "LOW".
- ALM HI: to set the upper limit of ST alarm. The maximum setting is +2.0. The minimum high limit should be 0.1 larger than the set low limit.
- ALM LOW: to set the lower limit of ST alarm. The minimum setting is -2.0. The maximum low limit should be 0.1 lower than the set high limit.

10.7.2 DEF point setup

Identify the analysis point for ST segment.

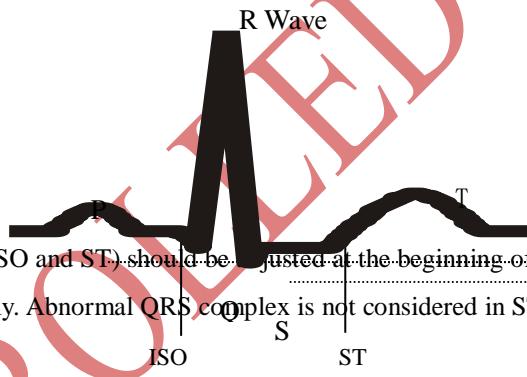
Select the "DEF POINT" item in "ECG SETUP" menu, in which the value of ISO and ST point can be set.

1. ISO (Base point): to set the baseline point.
2. ST (Starting point): to set the measurement point.



The ISO and ST are the two measurement points in ST segment, both of them can be adjusted.

The reference point is the position where the peak of R-wave locates (as figure below). The ST measurement value for each heartbeat complex wave is the difference between the two measurement points.



The position of measurement points (ISO and ST) should be adjusted at the beginning of monitoring, or the patient's HR or ECG waveform changes significantly. Abnormal QRS complex is not considered in ST segment analysis.

NOTE:

- Abnormal QRS complex is not considered in ST segment analysis.
- If the patient's HR or ECG wave has an obvious change, adjusting the ST measurement point is required.

10.7.3 Adjust ISO/ST point

When adjusting ST measurement point, the system will show the ST Measurement Point Window. The QRS complex template displays in the window (If the channel is not open, it will appear a prompt.) and the position of ISO line and ST line can be adjusted, click "ISO+", "ISO-", "ST+" or "ST-" to adjust.

NOTE:

- The alarm limits for two ST measurements are identical. The setting of alarm limits can not be made only for one channel.

10.7.4 ST alarms and Prompt messages

Among physiological alarms, those belonging to the type that the parameter has exceeded the limits may activate the recorder to automatically output the parameters and related measured waveforms when the alarms occur on the condition that the alarm record switch in related menu is On.

Possible physiological alarms during ST measurement are listed as below.

Physiological alarms:

Message	Cause	Alarm Level
ST TOO HIGH	ST measuring value is above the upper alarm limit.	User-selectable
ST TOO LOW	ST measuring value is below the lower alarm limit.	User-selectable

Technical alarms:

Message	Cause	Alarm Level	Remedy
ST ALM LMT ERR	Functional safety failure	HIGH	Stop using ST alarming function, notify biomedical engineer or Our service staff.

Prompt messages (include general alerts):

Message	Cause	Alarm Level
ST EXCEED	ST measuring value exceeds the measurement range.	HIGH

10.8 ARR Monitoring

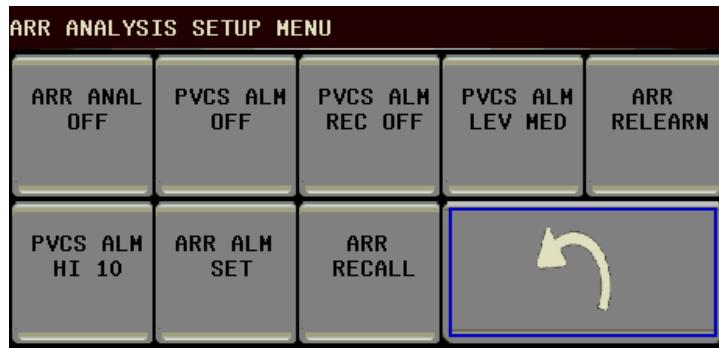
Arrhythmia analysis

The arrhythmia analysis is used to monitor ECG of neonate and adult patient in clinical, detect the changing of heart rate and ventricular rhythm, and also save arrhythmia events and generate alarming information. Arrhythmia analysis can monitor the patient with or without pacemaker. Qualified personnel can use arrhythmia analysis to evaluate patient's condition (such as heart rate, PVCs frequency, rhythm and abnormal heartbeat) and decide the treatment accordingly. Besides detecting the changing of ECG, arrhythmia analysis can also monitor patients and give proper alarm for arrhythmia.

- The arrhythmia monitoring is shutoff by default. You can enable it when necessary.
- This function can call up the doctor's attention to the patient's heart rate by measuring and classifying the arrhythmia and abnormal heart beat, and triggering the alarm.
- The monitor can conduct up to 13 different arrhythmia analysis.
- The monitor can store the latest 60 alarm events (a single-channel ECG waveform 4 seconds before and after the alarm) during the arrhythmia analysis process. The operator can edit these arrhythmia events through this menu.

10.8.1 ARR alarm setup

Select "ECG ALARM MENU" item in the "ECG SETUP" menu, input the initial password of alarm setup "70808", click "ST ANALYSE" to modify the following items:



ARR ANALYSIS SETUP Menu

- ARR ANAL: Pick "ON" during monitoring. Default set is "OFF".
- PVCS ALM: pick "ON" to enable prompt message and data record when alarm occurs; pick "OFF" to disable the alarm function, and there will be a  beside PVCs parameter area.
- PVCS ALM REC: pick "ON" to enable the recording when PVCs alarm occurs.
- PVCS ALM LEV: selectable from HIGH, MED, LOW. Level HIGH represents the most serious PVCs alarm.
- ARR RELEARN: press this button to start a learning procedure.
- PVCS ALM HI: PVCs alarm is activated when the PVCs exceeds the set ALM HI value.
- ARR ALM SET: to set the arrhythmia alarm. In this menu, "ALM" is the alarm switch, "ALM LEV" is alarm level, "ALM REC" is the switch of alarm recording.

ARR SET MENU				ARR SET MENU			
	PARA	ALM REC	ALM LEV		PARA	ALM REC	ALM LEV
ASYS TOLE	ON	OFF	HIGH	VFIB/ VTAC	ON	OFF	HIGH
R ON T	ON	OFF	MED	VT>2	ON	OFF	MED
COUP LET	OFF	OFF	MED	PVC	ON	OFF	MED
BIGE MINY	ON	OFF	MED	TACHY	OFF	OFF	MED
TRIGE MINY	OFF	OFF	MED	BRADY	OFF	OFF	MED
PNC	ON	OFF	MED	PNP	OFF	OFF	MED
MISSSED BEATS	ON	OFF	MED	SET THEM ALL			

ARR SET Menu

Pick "SET THEM ALL" to pop up the following menu:

SET ALL THE ALM ON	SET ALL THE ALM OFF
SET ALL THE REC ON	SET ALL THE REC OFF
SET ALL THE LEV HIGH	SET ALL THE LEV MIDDLE
SET ALL THE LEV LOW	O K

SET THEM ALL

User can select "SET ALL THE ALM ON" to open all alarms, select "SET ALL THE ALM OFF" to close the alarms. Select "SET ALL THE LEV HIGH" set the alarm level of ARR. to high level, "SET ALL THE LEV MIDDLE" to set the alarm level of ARR. to medium level, and "SET ALL THE LEV LOW" to set the alarm of ARR. to low level.

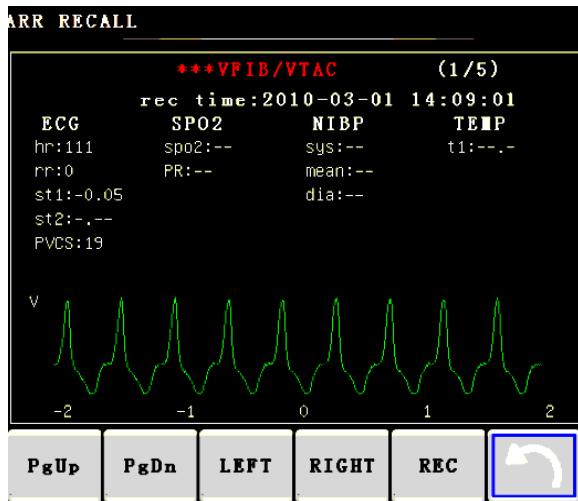
10.8.2 ARR Recall

- 1) Pick this item to review and edit the ARR analysis result.
- 2) Select "ARR RECALL" item in the "ARR SET MENU", the following interface will pop up.



ARR RECALL Menu

- The recent stored ARR events are listed in this interface:
 - ◆ PgUp/PgDn: Observe event lists of other pages.
 - ◆ PREV/NEXT: Select the Arr event, whose name displays in a protruding frame.
 - PREV: Previous one;
 - NEXT: Next one;
 - ◆ RENAME: Rename the selected Arr event, whose name is displayed in a green frame. Select the new name in a pop-up sub-menu after you picking this item.
 - ◆ WAVE: To display the Arrhythmia waveform, time and parameter value.
 - ◆ PgUp/PgDn: To observe waveforms of other Arrhythmia events.
 - ◆ LEFT/RIGHT: To observe 8-second waveform of Arrhythmia events.
 - ◆ REC: To print out displayed Arrhythmia event.
 - ◆ : To return to ARR RECALL menu of Arrhythmia event.
- In the arrhythmia waveform recall interface:



ARR WAVE RECALL Menu

- ◆ PgUp/PgDn: To observe waves of other Arrhythmia events.
- ◆ LEFT/RIGHT: To observe 8-second wave of Arrhythmia events.
- ◆ REC: To print out displayed Arrhythmia event.
- ◆ : To return to ARR RECALL menu of Arrhythmia event.

NOTE:

- If there are more than 60 Arrhythmia events, the latest ones will be retained.

10.8.3 PVCs Alarms and Prompt messages

Arrhythmia alarm

The alarm is triggered when an Arrhythmia occurs. If the ALM is ON, the alarm sounds and the alarm indicator flashes.

If the REC is ON, the alarm record will be printed out (the ECG waveform of the channel being analysed 4 seconds prior to and after the alarm).

Alarms and prompt messages related to arrhythmia analysis are listed as below:

Physiological alarm:

Prompt	Applicable Patient Type	Occurring Condition	Alarm Level
ASYSTOLE	All patients	No QRS is detected for 4 consecutive seconds	User-selectable
VFIB /VTAC	Without pacemaker	Fibrillatory wave for consecutive 4 seconds; or the number of continuous Vent beats is larger than the upper limit of cluster Vent beats (≥ 5). The RR interval is less than 600ms.	User-selectable
VT>2	Without pacemaker	$3 \leq$ the number of cluster PVCs < 5	User-selectable
COUPLET	Without pacemaker	2 consecutive PVCs	User-selectable
BIGEMINY	Without pacemaker	Vent Bigeminy	User-selectable

TRIGEMINY	Without pacemaker	Vent Trigeminy	User-selectable
R ON T	Without pacemaker	A type of single PVC under the condition that HR<100, R-R interval is less than 1/3 the average interval, followed by a compensating pause of 1.25X the average R-R interval (the next R wave advances onto the previous T wave).	User-selectable
PVC	Without pacemaker	Single PVCs not belonging to the type of above mentioned PVCs.	User-selectable
TACHY	All patients	5 consecutive QRS complex, RR interval is less than 500ms.	User-selectable
BRADY	All patients	5 consecutive QRS complex, RR interval is longer than 1.5S.	User-selectable
MISSED BEATS	Without pacemaker	When HR is less than 100 beats/min., no heart beat is tested during the period 1.75 times of the average RR interval; or when HR is larger than 100 beats/min, no beat is tested with 1 second.	User-selectable
PNP	With pacemaker	No QRS complex and pacing pulse are available during the period 1.75 times of the average R-R interval (only considering patients with pacemaker).	User-selectable
PNC	With pacemaker	When pacing pulse is available, no QRS exists during the period 1.75 times of the average RR interval (only considering patients with pacemaker).	User-selectable

Applicable patient type: "All patients" refers to perform Arr.analysis on patients either with pacemakers or without pacemakers.

"Without pacemaker": refers to perform Arr. Analysis only on the patients without pacemakers.

"With pacemaker": refers to perform Arr. Analysis only on the patients with pacemakers.

Prompt message:

Message	Cause	Alarm Level
ARR RELEARN	The QRS template building required for Arr. Analysis is in process.	No alarm

NOTE:

- Arrhythmia name displays in the alarm area.

Chapter 11 RESP Monitoring

11.1 Introduction

Measurement method: chest impedance. When the patient breathes, the thoracic activity causes a change in the thoracic impedance between the two ECG electrodes. The monitor produces a respiratory wave on the screen by measuring the impedance change (due to the movement of the thorax), then it calculates the respiration rate based on the waveform cycle.

11.2 Safety information

WARNING

- Respiratory measurement does not recognize the reason of suffocation, it will only give alarm if no next respiration is checked within the predetermined time after the last breath, so it can not be used for diagnostic purposes.

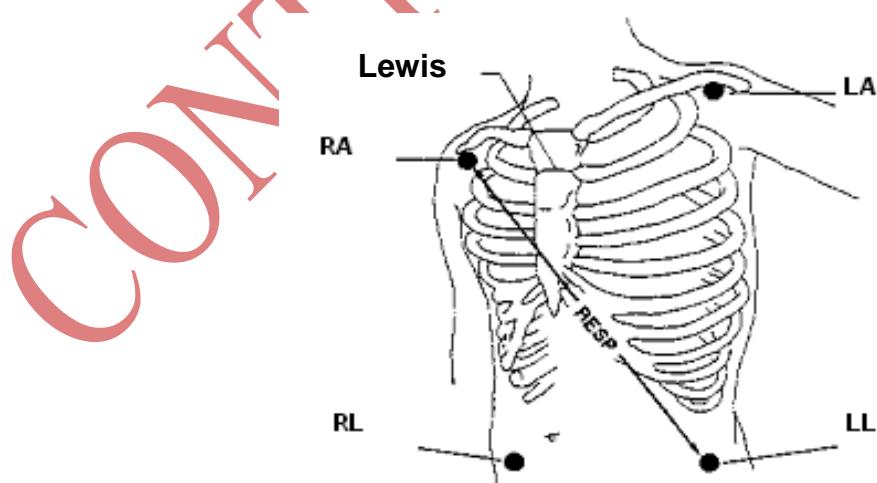
11.3 Placement for RESP electrode

As the skin is a bad conductor, in order to get a good respiration signal, process the skin where the electrode is placed is necessary. See "ECG Monitoring" chapter for skin processing method.

For RESP monitoring, it is not necessary for additional electrodes, however, the electrode placement is important. Some patients, due to their clinical condition, expand their chest laterally, causing a negative intrathoracic pressure. In these cases it is better to place the two RESP electrodes laterally in the right axillary and left lateral chest areas at the maximum point of breathing movement to optimize the respiratory waveform.

NOTE:

- The RESP monitoring is not recommended to be used on patients who are very active, as this can cause false alarms.



Electrodes Placement (5-lead)

NOTE:

- Placing the red and white electrodes diagonally to obtain the optimal respiration waveform. Avoid the liver area and the ventricles of the heart in the line between the RESP electrodes so as to avoid cardiac overlay or artifacts from pulsating blood flow. This is particularly important for neonates.

11.4 RESP SETUP

Press RESP hot key on the screen to "RESP SETUP" interface:



RESP SET Menu

- ◆ **ALARM:** when RESP alarm occurs, the system will prompt and store the alarm information after selecting "ON", it will not alarm when selecting "OFF", and "⚠" will appear in parameter area.
- ◆ **ALM REC:** pick "ON" to enable report printing upon RESP alarm.
- ◆ **ALM LEV:** HIGH, MED and LOW, high represents the most serious alarm.
- ◆ **ALM HI:** set the upper alarm limit.
- ◆ **ALM LO:** set the lower alarm limit.
- ◆ **SPEED:** Available options for RESP SWEEP SPEED are 12.5 and 25.0 mm/s.
- ◆ **APNEA ALM:** set the time of judging an apnea case, optional time: 10s, 15s, 20s, 25s, 30s, 35s and 40s.
- ◆ **WAVE AMP:** The user may set up the displaying amplitude of the RESP waveform. The selections are $\times 0.25$, $\times 0.5$, $\times 1$, $\times 2$, $\times 4$.
- ◆ **DEF SET:** pick this item to access the RESP DEFAULT CONFIG dialog box, in which the user may select whether the DEFAULT FACTORY CONFIG or the DEFAULT USER CONFIG is to be used. After selecting any of the items and exiting the dialog box, the system will pop up the dialog box asking for the user's confirmation.

11.5 RESP Alarm message

Among physiological alarms, those belonging to the type that the parameter has exceeded the limits may activate the recorder to automatically output the parameters and related measured waveforms when the alarms occur on the condition that the alarm record switch in the related menu is On.

Tables below describe the possible physiological alarms, technical alarms and prompt messages occurring during RESP measurement.

Physiological alarms:

Message	Cause	Alarm Level
RR HI	RESP measurement value is higher than upper alarm limit.	User-selectable
RR LOW	RESP measuring value is lower than lower alarm limit.	User-selectable

RESP APNEA	RESP can not be measured within specific time interval.	HIGH
------------	---	------

Technical alarms:

Message	Cause	Alarm Level	Remedy
RESP ALM LMT ERR	Functional safety failure	HIGH	Stop using RESP alarming function, notify biomedical engineer or our service staff.

Prompt message (general alerts):

Message	Cause	Alarm Level
RR EXCEED	RR measuring value exceeds the measure range.	HIGH

Chapter 12 SpO₂ Monitoring

12.1 Introduction

SpO₂ Plethysmogram measurement is employed to determine the oxygen saturation of hemoglobin in the arterial blood. If, for example, 97% hemoglobin molecules in the red blood cells of the arterial blood combine with oxygen, then the blood has a SpO₂ oxygen saturation of 97%. The SpO₂ numeric on the monitor will read 97%. The SpO₂ numeric shows the percentage of hemoglobin molecules which have combined with oxygen molecules to form oxyhemoglobin. The SpO₂/PLETH parameter can also provide a pulse rate signal and a plethysmogram wave.

How the SpO₂ / PLETH Parameter Works

- Arterial oxygen saturation is measured by a method called pulse oximeter. It is a continuous, non-invasive method based on the different absorption spectra of reduced hemoglobin and oxyhemoglobin. It measures how much light, sent from light sources on one side of the sensor, is transmitted through patient tissue (for example, a finger), to a receiver on the other side. The sensor measurement wavelengths are nominally 660nm for the Red LED and 880nm for Infrared LED. Maximum optical power output for the Red LED is 6.65 mW and the Infrared LED is 6.75 mW. Optical sensors as the light-emitting components, will bring influence to other medical devices applied the wavelength range. This information may be useful for clinicians who carry out optical therapy.
- The amount of light transmitted depends on many factors, most of which are constant. However, one of these factors, the blood flow in the arteries, varies with time, because it is pulsating. By measuring the light absorption during a pulsation, it is possible to get the oxygen saturation of the arterial blood. Detecting the pulsation gives a PLETH waveform and pulse rate signal.
- The SpO₂ value and the PLETH waveform can be displayed on the main screen.

12.2 Safety information

WARNING

- Only the SpO₂ sensor specified in this manual can be used, please use it following the Use Manual, and obey all warnings and precautions.
- Check if the sensor cable is in normal condition before monitoring. After unplugging the SpO₂ sensor cable from the socket, the system shall display the error message “SpO₂ SENSOR OFF” and give the audible alarm.
- Do not use the SpO₂ sensor once the package or the sensor is found damaged. Instead, you shall return it to the vendor.
- ES (Electrosurgery) equipment cable and SpO₂ cable must not be tangled up.
- Prolonged and continuous monitoring may increase the risk of unexpected change of skin condition such as abnormal sensitivity, rubescence, vesicle, repressive putrescence, and so on. It is especially important to check the sensor placement of patient of poor perfusion or immature dermogram by light collimation and proper attaching strictly according to changes of the skin. Check the sensor placement periodically and move it when the skin deteriorates. More frequent examinations may be required for different patients.
- The person who is allergic to silicone or ABS can not use this device.

-
- The SpO₂ probe accompanying with the monitor is only intended for use in this monitor. The monitor can only use the SpO₂ probe supplied in this manual. It is the operator's responsibility to check the compatibility of the monitor, probe and extension cord before use, to avoid the patient's injury.
-

NOTE:

- SpO₂ waveform is not proportional to the pulse volume.
- Some models of functional tester or patient simulator can measure the accuracy of the device that reproduces the calibration curve, but it can not be used to evaluate the accuracy of this device.
- SpO₂ function is calibrated to show functional oxygen saturation.
- The PLETH waveforms are not normalized, so the accuracy of the measured values may decrease when the waveform does not tend to be smooth and stable. When the waveform tends to be smooth and stable, the measured value is the best value, and the waveform is the most standard.
- The update time of measurement data is less than 10 seconds, which depends on the PR value. Data averaging and other signal processing have no effect on SpO₂ displaying and data values transmitted.
- The device does not need to be calibrated during maintenance.
- The accuracy of pulse rate has been verified by using a patient simulator.

12.3 SpO₂ Measurement

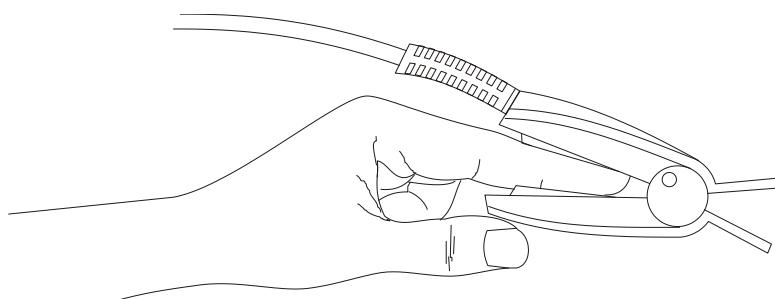
- 1) During measuring, make sure that the wearing parts meet the following conditions:
 - Pulsating blood flow, and circulation perfusion is well.
 - The thickness does not change, the thickness change will cause the mismatch for the sensor and wear parts.
- 2) PR will be displayed only under the following situations:
 - Select “PARAM SETUP” IN “MAIN MENU” interface to enter its sub-menu, then set “PR” to “ON”.

NOTE:

- Make sure the fingernail covers the light.
- The SpO₂ value is always displayed in a fixed place.
- The declaration for SpO₂ accuracy is supported by a clinical study covering the entire range.

12.4 Monitoring steps

- 1) Switch on the monitor.
- 2) Insert the sensor plug into the SpO₂ jack.
- 3) Attach the sensor to the appropriate site of the patient finger.



WARNING

- Check the wearing parts once per 2 to 3 hours to ensure the good skin texture and proper light alignment. If the skin texture changes, move the sensor to another location. It is best to change the wearing parts once per 4 hours.
-

NOTE:

- Do not use photoelectric oximeters and SpO₂ sensors during magnetic resonance imaging (MRI) scanning, as the induced current may cause burns.

12.5 Measurement Limitations

During measuring, the measurement accuracy can be affected by:

- High-frequency electrical interference, such as the interference created by the host system, or interference from external sources, for example electrosurgical apparatus connected to the system.
- Diagnostic test.
- Electrosurgery unit.
- Intravascular dye injections
- Electromagnetic field effects, such as nuclear magnetic resonance equipment.
- Excessive patient movement(patient moves actively or passively).
- Improper sensor installation or incorrect contact position of the patient
- Place the sensor on an extremity that has a blood pressure cuff, arterial catheter, or intravascular line.
- Significant concentrations of non-functional hemoglobin, such as carboxyhemoglobin(COHb) and methemoglobin(MetHb).
- Bad circular perfusion of the part being measured
- For some special patients, it should be a more prudent inspecting in the measurement part. The sensor can not be clipped on the edema and tender tissue.
- When the device is carried from cold environment to warm or humid environment, please do not use it immediately.
- As to the fingers which are too thin or too cold, it would probably affect the normal measurement of the patients' SpO₂ and pulse rate, please clip the thick finger such as thumb and middle finger deeply enough into the probe.
- Make sure the optical path is free from any optical obstacles like rubberized fabric, to avoid inaccurate measurement.
- Excessive ambient light may affect the measurement result. It includes fluorescent lamp, dual ruby light, infrared heater, direct sunlight, etc.
- The SpO₂ sensor and photoelectric receiving tube should be arranged in a way with the subject's arteriole in a position there between.
- Testee can not use enamel or other makeup.
- Testee's fingernail can not be too long.

12.6 SpO₂ SETUP

Pick the SpO₂ functional region on the screen, and the SpO₂ menu will pop up.



SpO₂ Menu

- ◆ ALARM: pick "ON", the system will give alarm prompt and store alarm information when SpO₂ alarm occurs; pick "OFF", the system will not give alarm and instead display a  beside "SpO₂".
- ◆ ALM REC: pick "ON", the system will command the recorder to output alarm information when SpO₂ alarm occurs.
- ◆ ALM HIGH/ALM LOW: SpO₂ alarm is activated when the result exceeds set SpO₂ ALM HI value or falls below SpO₂ ALM LO value.
- ◆ WAVE SPEED: Available options are 12.5mm/s, 25.0 mm/s.
- ◆ ALM LEV: set the alarm level, selectable from HI and MED.. HIGH represents the most serious case.

To further detect alarms for individual measurement parameters, perform a measurement check on yourself or by using the simulator, adjust the alarm limits setting and check if the correct alarm response is triggered.

WARNING

- Set the upper limit of SpO₂ alarm to completely equal to off-state upper limit alarm. High-oxygen level will cause fibrous fibrosis for preterm infants. Therefore, the upper limit of the SpO₂ alarm must be carefully chosen according to accepted clinical practice.

NOTE:

- The upper and lower limit of SpO₂ alarm will be displayed continuously in the SpO₂ parameter area.
- DEFAULT: Pick this item to access the SpO₂ DEFAULT CONFIG dialog box, in which you can select FACTORY DEFAULT CONFIG or USER DEFAULT CONFIG. After selecting one item and exiting the dialog box, the system will pop up the dialog box asking for your confirmation.

12.7 SpO₂ Alarm message

NOTE:

- There is no alarm delay for SpO₂.

SpO₂ alarm information

When the alarm switches are set to "ON" in relevant menus, the physiological alarms caused by the parameter

exceeding the alarm limit may possibly trigger the recorder to automatically output the alarm parameter value and corresponding waveforms.

Tables below describe the possible physiological alarms, technical alarms and prompt messages occurring during SpO₂ measurement.

Physiological alarm:

Message	Cause	Alarm Level
SpO ₂ TOO HIGH	SpO ₂ measuring value is above upper alarm limit.	User-selectable
SpO ₂ TOO LOW	SpO ₂ measuring value is below lower alarm limit.	User-selectable
PR TOO HIGH	PR measuring value is above upper alarm limit.	User-selectable
PR TOO LOW	PR measuring value is below lower alarm limit.	User-selectable

Technical alarms:

Message	Cause	Alarm Level	Remedy
SpO ₂ SENSOR OFF	SpO ₂ sensor may be disconnected from the patient or the monitor.	LOW	Make sure that the monitor and the patient are in correct connection with the cables.
SpO ₂ INIT ERR	SpO ₂ module failure	HIGH	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
SpO ₂ INIT ERR 1			
SpO ₂ INIT ERR 2			
SpO ₂ INIT ERR 3			
SpO ₂ INIT ERR 4			
SpO ₂ INIT ERR 5			
SpO ₂ INIT ERR 6			
SpO ₂ INIT ERR 7			
SpO ₂ INIT ERR 8			
SpO ₂ COMM STOP	SpO ₂ module failure or communication error	HIGH	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
SpO ₂ COMM ERR	SpO ₂ module failure or communication error	HIGH	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
SpO ₂ ALM LMT ERR	Functional safety failure	HIGH	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
PR ALM LMT ERR	Functional safety failure	HIGH	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.

Prompt message:

Message	Cause	Alarm Level
SpO ₂ EXCEED	SpO ₂ measuring value exceeds the range.	HIGH
PR EXCEED	PR measuring value exceeds the range.	HIGH
SEARCH PULSE	SpO ₂ module is searching for pulse.	No alarm
NO PULSE	SpO ₂ module cannot detect SpO ₂ signal for a long time.	HIGH

Chapter 13 NIBP Monitoring

13.1 Introduction

Measurement method: Oscillometry. It is applicable for adult, pediatric and neonate.

In order to know how the Oscillometry works, we compare it with auscultatory method:

- Auscultatory method: the doctor listens the blood pressure by the stethoscope, to obtain the systolic pressure and diastolic pressure. When the artery pressure curve is normal, the mean pressure can be calculated by the systolic pressure and diastolic pressure.
- Oscillometry: the blood pressure can not be listened by the monitor, it measures the vibration amplitude of cuff pressure. Cuff vibration appears when the blood pressure changes, the cuff pressure corresponding to the maximum amplitude is the mean pressure, the systolic and diastolic pressure can be calculated by the mean pressure.

In a word, the auscultatory method measures the systolic and diastolic pressure, then calculates the mean pressure. And the Oscillometry measures the mean pressure, then calculates systolic and diastolic pressure.

The clinical meaning for NIBP measurement must be determined by the physician.

When measuring during in representative patients group, compare the blood pressure values measured by the device and auscultatory method, its accuracy meets the requirements specified in IEC 80601-2-30:2009.

13.2 Safety information

WARNING

- Before measuring, make sure that the monitoring mode and cuff type you selected are appropriate for your patient(adult, pediatric or neonate). As false settings may imperil patient's safety, higher adult settings are not suitable for pediatric and neonate.
- You must not perform NIBP measurement on patients with sickle-cell disease or under any condition which the skin is damaged or expected to be damaged.
- For the patients with severe clotting mechanism abnormality, please determine whether automatically measure the blood pressure according to the clinical evaluation, as the rub position between the limb and cuff will have the risk of producing hematoma.
- Do not apply the cuff to a limb that has an intravenous infusion or catheter. This could cause tissue damage around the catheter when infusion is slowed or blocked during cuff inflation.
- NIBP measurement can be performed during electrosurgery and defibrillator discharge, as the device has the function of protecting burn patients.
- The device can be used in existence of electrosurgical equipment, but when using them together, user(doctor or nurse) should guarantee the patient's safety.
- Make sure that the air conduit connecting the blood pressure cuff and the monitor is neither blocked nor tangled.
- If liquid is inadvertently splashed on the device or its accessories, or may enter the conduit or inside the monitor, please contact with the maintenance department in hospital.

-
- Any NIBP measurement is influenced by the tester's posture and physical condition.
-

NOTE:

- If you are in doubt about the accuracy of any reading(s), check the patient's vital signs by an alternative method before checking the functioning of the monitor.
- When the alarm prompt information for low battery appears, it is not recommended to start NIBP measurement. As in this circumstance, it may cause device shutdown.

13.3 Measurement Limitations

NIBP measurement can not be done on the patients with extreme heart rate(lower than 40 bpm or higher than 240 bpm) or connecting with heart-lung machine.

The measurement may be inaccurate or can not be done in the following conditions:

■ Patient Movement

Measurement will be unreliable or may be impossible if the patient is moving, shivering or having convulsions. As these conditions may interfere the detection of the arterial pressure pulsation, and the measurement time will be prolonged.

■ Cardiac Arrhythmia's

Measurement will be unreliable and may be impossible if the patient has irregular heartbeat arisen from cardiac arrhythmia, and the measurement time will be prolonged.

■ Pressure Change

Measurement will be unreliable and may be impossible if the patient's blood pressure is changing rapidly over the period of time during which the arterial pressure pulsation are being analyzed to obtain the measurement values.

■ Severe Shock

If the patient is in severe shock or hypothermia, measurements will be unreliable since the decrease for the blood flowed to the peripheries will cause the reduction of artery pulsation.

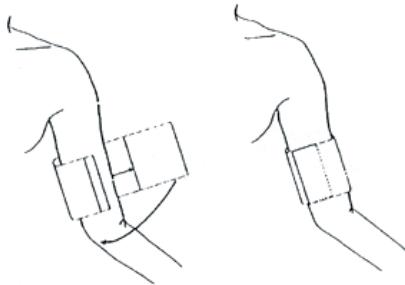
■ Fat patient

The thick fat layer under the limb will decrease the measurement accuracy, as the vibration from artery can not arrive to the cuff which is arisen from the fat damping.

13.4 Measurement steps

- 1) Confirm the patient type, if it is false, please change "PAT TYPE" in "PATIENT SETUP" of "MAIN MENU".
 - 2) Connect the airway tube with the NIBP interface of the device, then switch on the device.
 - 3) Select the cuff, make sure the cuff is completely deflated, then apply the cuff to the patient's arm or leg following the instructions below.
- Confirm the limb perimeter of the patient.
 - Apply the cuff to the patient's arm or leg, and make sure that the symbol "φ" exactly locates to the artery. Ensure that the cuff is not wrapped too tightly around the limb, otherwise it will cause discoloration or ischemia of the limb. Check the cuff edge is in the range marked <->, otherwise please change an appropriate cuff.
 - The width of the cuff should be either 40% of the limb circumference (50% for neonates) or 2/3 of the upper arm

length. The inflatable part of the cuff should be long enough to encircle 50-80% of the limb. The wrong size of cuff can cause erroneous readings. If the cuff size has problem, then use a larger cuff.



- 4) Connect the cuff to the airway tube. Make sure that the airway tube is neither blocked nor tangled.
- 5) Select a measurement mode in "NIBP SETUP" interface. Refer to the following paragraphs "Operation Hints" for Details.
- 6) Press "NIBP" button on the front panel to start a measurement.

13.5 Operation hints

- 1) Manual operation
 - Select "MANUAL" in "INTERVAL" item of "NIBP SETUP" interface, then press "NIBP" button on the front panel to start a manual measurement.
 - During the idle time of auto measuring process, press "NIBP" button on the front panel to start a manual measurement. Press "NIBP" button again to stop manual measurement and the system continues auto measuring.
- 2) Auto measuring

Select a interval value in "INTERVAL" item of "NIBP SETUP" interface to perform auto measurement., then press "NIBP" button on the front panel to start the first measurement, after finishing, the system will automatically measure according to the interval time.

- 3) Continuous measuring
- Select "CONTINUE" item in "NIBP SETUP" interface to start a continuous measurement. The process will continue 5 minutes.

- 4) Stop measuring
- During measuring, press "NIBP" button on the front panel to stop measuring.

WARNING

- In auto or continuous mode, if the time is too long, then the limb rubbed with the cuff may appear purpura, ischemia and nerve injury. So when monitoring the patient, patient's limb color, warmth and sensitivity should be checked frequently. Once any abnormality appears, please replace the cuff location or stop the NIBP measurement.
-

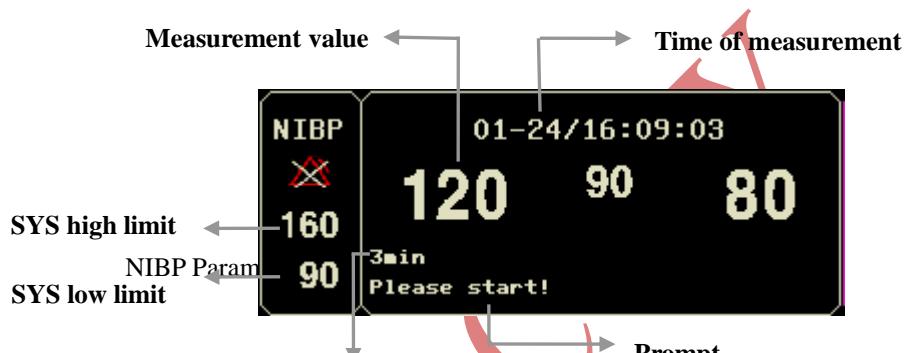
13.6 Amend results

Keep the limb to be measured and the patient's heart on one horizontal position. Otherwise amend the measurement results by the following methods:

- If the cuff is higher than the horizontal position of the heart, then the value should add 0.75 mmHg(0.10 kPa) after the displayed value.
- If the cuff is lower than the horizontal position of the heart, then the value should subtract 0.75 mmHg(0.10 kPa) after the displayed value.

13.7 NIBP display

There is no waveform for NIBP measurement, it only displays the NIBP measurement results. The following figure is only used for reference, your device may display a different interface.



13.8 NIBP SETUP

Pick the NIBP functional region on the screen to pop up the NIBP measurement as below:



- **ALARM:** when pressure alarm occurs, the system will prompt and store the alarm information after selecting "ON", it will not alarm when selecting "OFF", and "✗" will appear in parameter area.
- **ALM REC:** pick "ON" to enable report printing upon NIBP alarm.
- **ALM LEV:** selectable from HIGH, MED to LOW. HIGH represents the most serious case.
- **SYS HIGH, SYS LOW, MEAN HI, MEAN LOW, DIA HIGH, DIA LOW:** are for the user to set up the alarm limit for each type of pressure. NIBP alarm is activated when the pressure exceeds set upper alarm limits or falls below lower alarm limits.
- **UNIT:** Pick this item to set measurement unit. (Option: mmHg or kPa)

Press this button to select the initial pressure value for the cuff next time, there are different pre-inflation value ranges in different default configurations, as shown in the following table.

Default setup	Default pre-inflation value(mmHg/kPa)	Selectable pre-inflation value in NIBP menu(mmHg/kPa)
---------------	---------------------------------------	---

Default adult configuration for factory	150	80/100/120/140/150/160/180/200/220/240
Default pediatric configuration for factory	100	80/100/120/140/150/160/180/200
Default neonatal configuration for factory	70	60/70/80/100/120
Default adult configuration for user	150	80/100/120/140/150/160/180/200/220/240
Default pediatric configuration for user	100	80/100/120/140/150/160/180/200
Default neonatal configuration for user	70	60/70/80/100/120

Press "MENU" button to enter "MAIN MENU" menu, then select a factory or user configuration in "DEFAULT SETUP" menu, after configuration, return to the main interface to select NIBP hot key to enter "NIBP SETUP" menu. Here the initial value for "Inflation" is the initial inflation pressure value corresponding to default configuration, as shown in the above table. Move the cursor to the "Inflation" item and press it, inflation value range(as shown in the above table) in MANUAL mode can be seen.

NOTE:

- "Inflation" is used to help user select the cuff inflation pressure next time, but the subsequent inflation is the measurement value of last systolic pressure based on the same patient. The system memorizes the value, which can shorten the measurement time of the same patient and increase the measurement accuracy.
- If user only sets the "PAT TYPE" in "PATIENT SETUP" interface, does not perform any selection in "DEFAULT SETUP", the system will operate according to the initial setting of relative module parameter in "Patient type". The change of default type setting in "DEFAULT SETUP" will alter the "PAT TYPE" in "PATIENT SETUP" interface.

■ INTERVAL

Interval time in AUTO mode: 1/2/3/4/5/10/15/30/60/90/120/180/240/480 minutes. After selecting the interval time, the information "Please start!" will appear in the NIBP prompt area, then press "NIBP" button to start the first auto measurement. Select "MANUAL" in interval time to stop auto measuring and enter to manual measurement.

■ CONTINUE

Start a continuous measurement, after selecting it, the menu will automatically disappears and measure continuously.

■ MODULE RESET

Restore measurement status of the pressure pump. Press this button to restore the initial settings of the pressure pump. When the pressure pump does not work properly and the system fails to give prompt information for the problem, press this button to activate self-test procedure, thus restore the system from abnormal performance.

■ CALIBRATE(NIBP pressure calibration)

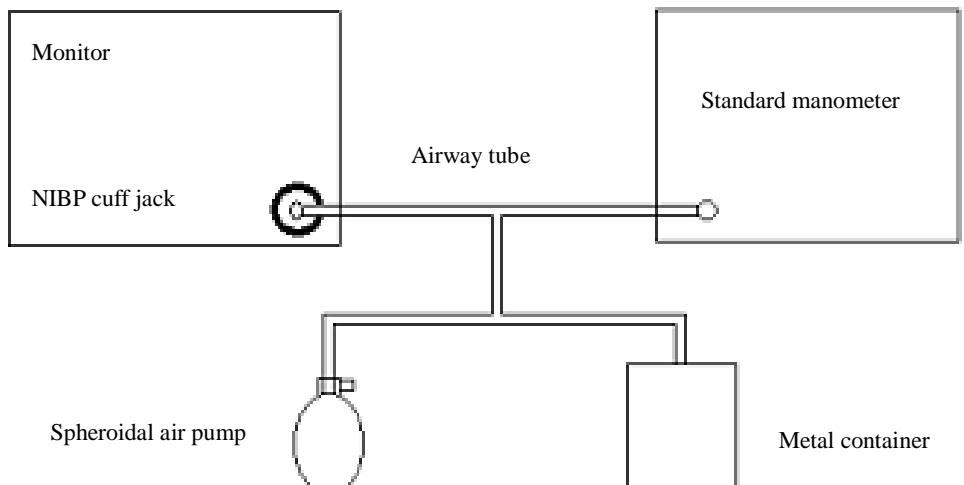
NIBP pressure calibration should be performed once per two years at least or once when you thought that the reading is inaccurate.

◆ Prepared materials:

- ❖ Standard manometer
- ❖ Metal container(500 ml)
- ❖ Spheroidal air pump
- ❖ Airway tube

- ❖ T-shape connector
- ◆ Procedures of the Pressure Transducer Calibration

Replace the cuff with a metal container with a capacity of $500 \text{ ml} \pm 5\%$. Connect a calibrated standard manometer, spheroidal air pump(error less than 0.8 mmHg) and airway tube to the NIBP cuff jack of the module by a T-shape connector. Set the monitor in "CALIBRATE" mode. Inflate the pressure in the metal container to 0, 50 and 200 mmHg by spheroidal air pump separately. The difference between the indicated pressure of the standard manometer and the monitor will not exceed 3 mmHg. Otherwise, please contact our customer service.



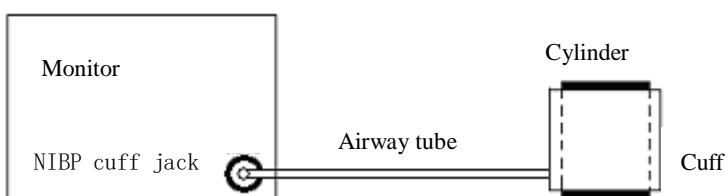
■ PNEUMATIC

It is mainly used to check whether prompt any information. Otherwi leakage test should be performed o

- ◆ Prepared materials:
 - ❖ Adult cuff: one
 - ❖ Airway tube: one
 - ❖ Cylinder: one
- ◆ Procedure of the air leakage test:

- 1) Set the "Patient type" to "Adult".
- 2) Connect the cuff with the NIBP cuff jack.
- 3) Wrap the cuff around the cylinder of an appropriate size.

- CONFROLL*
- 4) Select "PNEUMATIC" in NIBP menu, then the information "Pneum testing..." will display in the NIBP parameter area.
 - 5) The system will automatically inflate to 180 mmHg.
 - 6) The system will automatically deflate after about 20s, it indicates that the air leakage test has finished.
 - 7) If no prompt information appears in NIBP parameter area, it indicates that the airway is in good situation and no air leaks exist. However if the prompt information "NIBP PNEUMATIC LEAK" appears, it indicates that the airway may have air leaks. In this case, the user should check whether the connection is loose. After confirming properconnections, the user should re-perform the pneumatic test. If the failure prompt still appears, please contact



the manufacturer for maintenance.

WARNING

- This pneumatic test other than being specified in the EN 1060-1 standard is to be used by the user to simply determine whether there are air leaks in the NIBP airway. If at the end of the test, the system prompts that the NIBP airway has air leaks, please contact the manufacturer for maintenance.
- DEFAULT SETUP: Select "DEFAULT SETUP" to enter "NIBP DEFAULT CONFIG SETUP" interface, the user may select "DEFAULT FACTORY CONFIG" or "DEFAULT USER CONFIG". After selecting, the system will prompt for your confirmation.

13.9 NIBP Calibration

When the user can not calibrate the NIBP, please contact with the maintenance personnel. The cuff pressure transducer should be maintained by the qualified service personnel, and it should be checked and calibrated once per two years at least.

13.10 NIBP Alarm Message

Physiological alarm belongs to the alarm which triggers by the parameters exceeding the limits, which may activate the recorder to automatically output the parameters and related measured waveforms when the alarms occur on the condition that the alarm record switch in the related menu is On.

Tables below describe the possible physiological alarms, technical alarms and prompt messages occurring during NIBP measurement.

Physiological alarms:

Message	Cause	Alarm Level
SYS HI	NIBP SYS measuring value is above upper alarm limit.	User-selectable
SYS LOW	NIBP SYS measuring value is below lower alarm limit.	User-selectable
DIA HI	NIBP DIA measuring value is above upper alarm limit.	User-selectable
DIA LOW	NIBP DIA measuring value is below lower alarm limit.	User-selectable
MAP HI	NIBP MAP measuring value is above upper alarm limit.	User-selectable
MAP LOW	NIBP MAP measuring value is below lower alarm limit.	User-selectable

Technical alarms 1: (display in information area)

Message	Cause	Alarm Level	Remedy
SYS ALM LMT ERR	Functional safety failure	HIGH	Stop using alarming functions of NIBP module and notify biomedical engineer or Our service staff.
DIA ALM LMT ERR	Functional safety failure	HIGH	Stop using alarming functions of NIBP module and notify biomedical engineer or Our service staff.
MEAN ALM LMT ERR	Functional safety failure	HIGH	Stop using alarming functions of NIBP module and notify biomedical engineer or Our service staff.

Technical alarms 2: (display in the area below the NIBP value)

Message	Cause	Alarm Level	Remedy
NIBP SELF TEST ERR	Sensor or other hardware of NIBP module is incorrect.	HIGH	Stop using measuring function of NIBP module, notify biomedical engineer or Our service staff.
NIBP COMM ERR	Communication with NIBP module is failed.	HIGH	If failure persists, stop using measuring function of NIBP module, notify biomedical engineer or Our service staff.
LOOSE CUFF	Cuff is no properly wrapped or no cuff exists.	LOW	Properly wrap the cuff.
AIR LEAK	Cuff, hose or connector is damaged.	LOW	Check and replace the leaking parts, if required, notify biomedical engineer or Our service staff.
AIR PRESSURE ERROR	Stable pressure value is not available. e.g. hoses are tangled.	LOW	Check if the hoses are tangled, if failure persists, notify biomedical engineer or Our service staff.
WEAK SIGNAL	Cuff is too loose or patient pulse is too weak.	LOW	Use other method to measure blood pressure.
RANGE EXCEEDED	Measuring range exceeds the specified upper limit.	HIGH	Reset NIBP module, if failure persists, stop using measuring function of NIBP module, notify biomedical engineer or Our service staff.
EXCESSIVE MOTION	Affected by arm motion, signal noise is too large or pulse rate is not regular.	LOW	Make sure that the patient under monitoring is motionless.
OVER PRESSURE	Pressure has exceeded the specified upper safety limit.	HIGH	Measure again, if failure persists, stop using measuring function of NIBP module and notify biomedical engineer or Our service staff.
SIGNAL STURATED	Excessive motion	LOW	Stop the patient from moving.
PNEUMATIC LEAK	During pneumatic test, leak is detected.	LOW	Check and replace the leaking parts, if required, notify biomedical engineer or Our service staff.
NIBP SYSTEM FAILURE	Operation of blood pressure pump system is failed.	HIGH	Stop using measuring function of NIBP module, notify biomedical engineer or Our service staff.
CUFF TYPE ERR	Cuff type does not comply with the patient type.	LOW	Select appropriate cuff type.
NIBP TIME OUT	Measuring time has exceeded 120 seconds (adult) or 90 seconds (neonatal).	HIGH	Measure again or use other measuring method.
NIBP ILLEGALLY RESET	Abnormal module reset	HIGH	Reset again.
MEASURE FAIL	Problem happens when measuring the curve. The system cannot perform measurement, analysis or calculation.	HIGH	Check the cuff. Make sure that the patient under monitoring is motionless. Measure again.

Prompt message: (display in the prompt area below NIBP value)

Message	Cause	Alarm Level
Manual measure...	During manual measuring mode	No alarm

Cont measuring...	During continuous measuring mode
Auto measuring...	During automatic measuring mode
Please start !	After selecting interval between measurements in MENU
Measurement over	Press STAR key during measuring to stop measurement
Calibrating...	During calibrating
Calibration over	Calibration over
Pneum testing...	During pneumatic test
Pneum test over	pneumatic test over
Resetting...	NIBP module in resetting
Reset failed	NIBP module reset failed

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Chapter 14 TEMP Monitoring

14.1 Introduction

Two TEMP probes can be used together to obtain 2 temperature data, via comparing, the temperature difference can be obtained.

14.2 Safety information

WARNING

- Verify whether the probe cable is normal before monitoring. Unplug the temperature probe cable from the socket, the screen will display the error message “T1/T2 TEMP OFF” and the audible alarm is activated.
- Take and place the temperature and cable carefully, and they should be rolled to loose loop when not used. If internal electric wires are pulled too tight, the mechanical damage will appear.
- The calibration of the temperature measurement is necessary for every two years (or as frequently as dictated by your Hospital Procedures Policy). When you need calibrate the temperature measurement, contact the manufacture please.

14.3 Measurement

Measurement steps:

- 1) Select an appropriate TEMP probe according to patient type and measurement requirement.
- 2) Insert the probe cable into the TEMP jack directly.
- 3) Attach the TEMP probe to the patient properly.
- 4) Confirm that the alarm settings are suitable for the patient.

NOTE:

- Disposable TEMP probe can only be used once for one patient.
- The self-test of the temperature measurement is performed automatically once per 30s during the monitoring. The test procedure lasts about 1s, which does not affect the normal measurement of the temperature monitoring.

14.4 TEMP SETUP

Pick the TEMP functional region on the screen to pop up the TEMP SETUP menu shown as below:



Time Setup Menu

- ALARM: pick "ON" to enable prompt message and data record during the TEMP alarm; pick "OFF" to disable the

alarm function, and prompt the  symbol beside TEMP area.

- ALM REC: used to start/stop recording TEMP alarms. Pick "ON" to enable report printing upon TEMP alarm.
- ALM LEV: used to set up the alarm level, selectable from HIGH, MED or LOW.
- TEMP UNIT: To set temperature unit ($^{\circ}\text{C}$ or $^{\circ}\text{F}$).
- ALM HI, ALM LO: Alarm for TEMP occurs when the measured temperature exceeds set alarm high limit or falls below alarm low limit.
- DEF SET: Select "DEF SET" to enter "TEMP DEFAULT CONFIG SETUP" interface, the user may select "DEFAULT FACTORY CONFIG" or "DEFAULT USER CONFIG". After selecting, the system will prompt the user to confirm, then exit.

14.5 TEMP Alarm message

The alarm which triggers by the parameters exceeding the limits, which may activate the recorder to automatically output the parameters and related measured waveforms when the alarms occur on the condition that the alarm record switch in the related menu is On.

Tables below describe the possible physiological alarms, technical alarms and prompt messages occurring during TEMP measurement.

Physiological alarms:

Message	Cause	Alarm Level
TEMP HI	Measuring value is above upper alarm limit.	User-selectable
TEMP LOW	Measuring value is below lower alarm limit.	User-selectable

Technical alarms:

Alarm Message	Cause	Alarm Level	Remedy
TEMP SENSOR OFF	Temperature cable may be disconnected from the monitor.	LOW	Make sure that the cable is properly connected.
TEMP ALM LMT ERR	Functional safety failure	HIGH	Stop using alarming function of TEMP module, notify biomedical engineer or Our service staff.

Prompt message:

Message	Cause	Alarm Level
TEMP EXCEED	Measuring value is beyond measuring range.	HIGH

Chapter 15 Battery

15.1 Introduction

The device can configure the rechargeable battery(lithium battery), which can ensure that the device can be used normally when the patient is moving in hospital or in the condition of power failure. The battery can be charged once connecting to the AC, no matter whether the the device is powered on. When sudden power interruption appears, the system will operate by the battery.

15.2 Battery status information

The battery status information displays the battery condition, which can be used to estimate the monitoring time.



The battery works normally, and the solid represents the battery power.



The battery power is low and low-battery alarm appears, it indicates that the battery needs to be charged immediately.



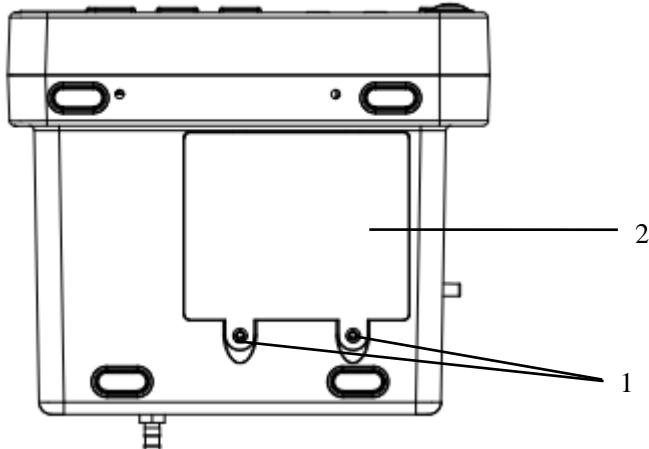
The battery is not installed.

Working by the battery can only maintain a period of time. Too low voltage will trigger high-level technical alarm "Low battery", then you should charge to the battery, otherwise it will shut down after the first alarm (about 5 minutes).

15.3 Battery installation

Refer to the following contents to install or replace the battery:

1. Unscrew the screws, then open the battery compartment cover.



1	Screws(M3*6)
2	Battery compartment cover

2. Disconnect the battery and the internal connection lines, then install the new battery.
3. Install the battery compartment cover, then screw on the screws.

15.4 Check for battery performance

The battery performance may decrease with the increasing of use time. Please refer to the following steps to check the battery performance.

- 1) Disconnect the connection between the device and the patient to stop all monitoring and measurement.
- 2) Connect the device to AC to continuously charge the battery for above 10 hours.
- 3) Disconnect the AC, use the battery to supply power for the device till shutdown.

-
- 4) Battery-powered time reflects the battery performance.

If the battery-powered time is obviously lower than the time claimed in the Specification, please replace the battery or contact the service personnel.

WARNING

- Please read the manual and safety information carefully before using the rechargeable lithium battery(hereinafter referred to as "battery").
 - Keep the battery out of children's reaching.
 - Don't take out the battery during monitoring.
 - Don't connect the anode and cathode falsely to avoid explosive hazard.
 - Don't heat the battery or throw it into the fire.
 - Don't use the battery near the fire source or in the environment of temperature over +60°C.
 - Don't throw the battery into the water, nor wet the battery.
 - Don't destroy the battery: don't chisel the metal into the battery, or hammer or knock the battery, or use other methods to destroy the battery, to avoid the the battery heating, smoking, deformation or burning, even producing risks.
 - Only the battery specified by the manufacturer can be used.
 - The battery can only be used in the device. Necessary maintenance must be performed by qualified and trained service engineers ONLY.
 - If the electrolyte exudes and enters your eye, please don't knead your eye, use clean water to rinse immediately and go to the doctor.
 - If there is the sign of battery damage or leakage, please replace it immediately. Don't use the faulted battery.
-

NOTE:

- In order to protect the environment, please recycle the scrap battery as the regulations.
- When the device is turned off arisen from power failure, the system will save the latest settings before power failure when it is turned on again.

15.5 Battery maintenance

The battery should be maintained periodically to prolong its use life, pay attention to the following instructions:

- During storing the battery, please charge to it once per 3 months at least.
- Battery performance must be checked once per 2 years. And it also should be checked when the device is maintained or you doubt the battery is the fault source.
- Please take out the battery before transporting the device or the device is not used over 3 months.
- If the device is not used for a long time, and the battery is not taken out, please charge to the battery once per 3 months, to avoid shortening the battery life.

15.6 Battery recycle

The battery should be replaced and recycled properly if it has obvious damage or it can not store the power normally. The disposal of scrap battery should follow the relevant laws and regulations.

WARNING

- Don't disassembly the battery, or throw it into the fire, or make it short circuit. As battery burn, explosion or leakage may injury to the human.
-

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Chapter 16 Maintenance and Cleaning

Only use the material and method listed in this chapter to clean or maintain the device. Otherwise we do not provide any guarantee.

Our company has verified the cleaning and disinfection methods described in the manual. Professional personnel in hospital should obey the manual to ensure sufficient cleaning and disinfection.

16.1 Introduction

Keep the device and accessories out of dust. In order to prevent damage, please obey the following rules:

- Please dilute the detergent and disinfectant according to the manufacturer's instructions, or adopt the lower concentration as soon as possible.
- Don't immerse the device into the liquid.
- Don't pour the liquid into the device or accessories.
- Don't allow liquid to enter into the enclosures.
- Don't use abrasion material(such as steel wool or silver polishing agent) and any strong solvent(such as acetone or the detergent contained acetone).

16.2 Cleaning

The device should be cleaned periodically, in the area of seriously polluted or greater sand wind, cleaning frequency should be increased. Before cleaning, please consult or understand the regulations about device cleaning in advance.

Selectable detergents:

- Diluted ammonia water
- Diluted sodium hypochlorite(Bleaching powder).
- Hydrogen Peroxide(3%)
- Alcohol(70%)
- Isopropanol(70%)

When cleaning the device with the adsorption detergent, or wipe the residual detergent after cleaning, please use the clean and non-corrosive soft cloth or paper towel.

16.2.1 Cleaning for host

Clean the device surface according to the following steps:

- 1) Turn off the power and unplug the power cord.
- 2) Use the soft cloth adsorbed proper detergent to completely wipe the external surface(including the LCD) of the device until that there is no obvious dirt.
- 3) After cleaning, please use the new cloth or paper towel adsorbed proper tap-water to wipe the residual detergent until that there is no obvious dirt.
- 4) Place the device in ventilation and shady environment for air drying.

WARNING

-
- Before cleaning, make sure that the device is switched off and disconnected from the power cord.
-

CAUTION

- If the liquid is poured into the device or the accessories carelessly, please contact with our company or our service personnel immediately.
-

16.2.2 Cleaning for the reusable accessories

16.2.2.1 Cleaning for the ECG lead cables

- 1) Use the soft cloth adsorbed proper detergent to completely wipe the lead cable surface until that there is no obvious dirt.
- 2) After cleaning, please use the new cloth or paper towel adsorbed proper tap-water to wipe the residual detergent until that there is no obvious dirt.
- 3) Use a dry soft to wipe the residual water.
- 4) Place the lead cable in ventilation and shady environment for air drying.

16.2.2.2 Cleaning for NIBP cuff

Clean the cuff:

- 1) Take out the gasbag before cleaning.
- 2) The cuff should not be dry-cleaned, but it can be machine-washed or hand-washed, and the latter method may prolong the service life of the cuff. The cuff can be sterilized by means of conventional autoclaving, gas, or radiation sterilization in hot air ovens or disinfected by immersing in decontamination solutions, but remember to remove the gasbag if you use this method.
- 3) After cleaning, please use the new cloth or paper towel adsorbed proper tap-water to wipe the residual detergent until that there is no obvious dirt.
- 4) Use a dry soft to wipe the residual water.
- 5) Place the cuff in ventilation and shady environment for air drying.

Replace the gasbag:

After cleaning, install the gasbag into the cuff according to the following steps:

- 1) Roll up the gasbag lengthwise, place it into the cuff from the cuff side of the big opening.
- 2) Thread the leather hose of airbag from the small hole on the cuff, from inside to outside.
- 3) Adjust the gasbag location in cuff.

16.2.2.3 Cleaning for SpO₂ probe

- 1) Use the soft cloth adsorbed proper detergent to wipe the probe and lead cable surface until that there is no obvious dirt.
- 2) Use the cotton swab adsorbed proper detergent to completely wipe the contact position between the probe and the patient until that there is no obvious dirt.
- 3) After cleaning, please use the new cloth or paper towel adsorbed proper tap-water to wipe the residual detergent until that there is no obvious dirt.
- 4) Use a dry soft to wipe the residual water.
- 5) Place the probe in ventilation and shady environment for air drying.

16.2.2.4 Cleaning for TEMP probe

- 1) Use the soft cloth adsorbed proper detergent to wipe the contact position between the probe and the patient until that there is no obvious dirt.
- 2) After cleaning, please use the new cloth or paper towel adsorbed proper tap-water to wipe the residual detergent until that there is no obvious dirt.
- 3) Use a dry soft to wipe the residual water.
- 4) Place the probe in ventilation and shady environment for air drying.

16.3 Disinfection

To avoid extended damage to the device, disinfection is only recommended when stipulated as necessary in the Hospital Maintenance Schedule. The device should be cleaned firstly before disinfection.

Disinfectant recommended: alcohol(70%), isopropanol(70%).

If alcohol or isopropanol is used in both cleaning and disinfection, please cleaning cloth for disinfection.

Chapter 17 Maintenance

WARNING

- The hospital or medical institution using the device should establish a perfect maintenance plan, otherwise it may result in device failure and unpredictable consequences, even endanger personal safety.
 - All safety inspections or maintenance works to the components to be disassembled should be carried out by professional service personnel, otherwise it may result in device failure, even endanger personal safety.
 - If any problem has been found, please contact the service person or our company.
-

17.1 Check

The device should be completely checked before using, or after continuous use of 6 to 12 months, maintenance or upgrading, to ensure normal operation and working.

The items to be checked should include:

- Environment and power meet the requirements.
- No abrasion and good insulation performance for the power cord.
- No mechanical damage for the device and accessories.
- The accessories specified are used.
- Alarm functions are normal.
- The recorder works normally, the recording paper conforms with specified requirements.
- Battery performance.
- Each monitoring function is in good working state.
- Ground impedance and leakage current conform requirements.

If any signs of damage to the instrument can be found, please don't use the monitor to perform any monitoring on the patient. And contact the medical engineer of the hospital or the maintenance engineer of the company.

All inspections that require to open the device must be carried out by qualified service personnel. Safety and maintenance inspections may also be carried out by personnel of the Company.

17.2 Troubleshooting

■ Power failure

Install the battery when using the device. As if the mains is disconnected, the device supplied power by the battery, which only sustains a period of time, and it will be automatically switched to mains when it is connected. A low battery voltage will trigger a high-tech alarm "Low battery", and it will shut down after the first alarm (about 5 minutes), then all trend data will be lost.

■ Troubleshooting

Other problems related to ECG measurement

Symptoms	Possible reasons and solutions
Noisy ECG signal or no QRS waveform is checked.	<ul style="list-style-type: none"> • Make sure that the patient does not tremble. Incorrect ECG filter. • The electrode is poor in quality or placed in a wrong position. Check the electrodes, cables and their placement. Refer to "ECG Monitoring" for details. • Replace a lead. Remove the ECG cable from the interface and insert it again.
Thick ECG baseline.	<p>ECG cable is looped.</p> <p>Other power cables are close to ECG lead cables.</p> <p>Inappropriate power frequency.</p>

Other problems related to RESP measurement

Symptoms	Possible reasons and solutions
Failure in RESP measurement.	<ul style="list-style-type: none"> • Check electrode quality and placement. • Other electrical equipment may interfere with the measurement.

Other problems related to NIBP measurement

Symptoms	Possible reasons and solutions
NIBP measurement can not be performed.	<ul style="list-style-type: none"> • Check whether the cuff is bent, stretched, squeezed, or loose. • Use a cuff in proper size.

Other problems related to TEMP measurement

Symptoms	Possible reasons and solutions
Failure in TEMP measurement.	<ul style="list-style-type: none"> • Check whether an appropriate probe is used. • Try the other one.

Other problems related to SpO₂ measurement

Symptoms	Possible reasons and solutions
The signal is weak.	<ul style="list-style-type: none"> • Check the probe and its placement. • Note that skin pigmentation can cause deviations. • Make sure the patient is not trembling.

Other problems related to battery

Symptoms	Possible reasons and solutions
Battery working time significantly shortens.	<ul style="list-style-type: none"> • Maintain the battery according to the descriptions in the manual

Other conditions

Other possible conditions and reasons are listed in the table.

Other operation problems

Symptoms	Possible reasons and solutions

The device can not print.	<ul style="list-style-type: none"> The battery power is low and the host is not connected to AC.
The measurement value does not display.	<ul style="list-style-type: none"> Check if you have selected the required parameters for the waveform or digital area.
The device can not turn on.	<ul style="list-style-type: none"> Check whether the power cord is connected correctly. Check the fuses and replace them if necessary.
The screen stop in LOGO interface.	<ul style="list-style-type: none"> Replace the mainboard, or contact the engineer to re-brush the mainboard program.

17.3 Maintenance plan

The following tasks can only be performed by the professional maintenance staff authorized by our company. Please contact the service personnel when you need the following maintenance. Before test or maintenance, the device must be cleaned and disinfected.

Check/maintenance items	Frequency
Safety check according to IEC60601-1.	When replacing the power supply or after the device falls off.
NIBP air leakage check.	At least once per two years, or check according to the provisions of the hospital.
NIBP pressure check.	At least once per two years, or check according to the provisions of the hospital.
NIBP calibration.	At least once per two years, or check according to the provisions of the hospital.
TEMP calibration.	At least once per two years, or check according to the provisions of the hospital.

Chapter 18 Accessories

WARNING

- Use only the accessories specified in this chapter, as other accessories may damage the monitor or fail to meet the specifications stated in this manual.
- Disposable accessories can only be used once, repeated use may lead to performance degradation or cross infection.
- If you find any damage to the accessories packing or accessories, please do not use the accessories.

18.1 ECG Accessories

ECG electrodes

Accessory No.	Accessory name	Description	Remark
1.4.07.00002	ECG electrode, adult, one packet(20 pcs)	Disposable	/
1.4.07.00003	ECG electrode, child, one packet(20 pcs)		

ECG cable

Accessory No.	Accessory name	Description	Remark
2.3.04.00213	5-lead, American Standard, adult gold-plated button-type		
2.3.04.00214	5-lead, European standard, adult gold-plated button-type		
2.3.04.00215	5-lead, American Standard, children's gold-plated clip-type		
2.3.04.00216	5-lead, European Standard, children's gold-plated clip-type		
2.3.04.00229	3-lead, American Standard, adult gold-plated button-type	Repeatable	/
2.3.04.00230	3-lead, European Standard, adult gold-plated button-type		
2.3.04.00231	3-lead, American Standard, children's gold-plated clip-type		
2.3.04.00232	3-lead, European Standard, children's gold-plated clip-type		
2.3.04.00244	5-lead, American Standard, anti-defibrillation, adult gold-plated button-type		
2.3.04.00246	5-lead, American Standard, anti-defibrillation, children's gold-plated clip-type		

18.2 SpO₂ Accessories

SpO₂ probe

Accessory No.	Accessory name	Applicable Population	Description	Remark
2.3.08.00004	Adult fingertip SpO ₂ probe(3m)	Adult(>40 Kg)	Repeatable	Integrated SpO ₂ probe
2.3.08.00007	Children fingertip SpO ₂ probe(3m)	Children(10~40 Kg)		
2.3.08.00020	Adult fingerstall SpO ₂ probe(3m)	Adult(>40 Kg)	Adult(>40 Kg)	
2.3.08.00025	Adult fingertip SpO ₂ probe(old version, 3m)			

2.3.08.00003	DB7 adult fingertip SpO ₂ probe(1m)	Adult(>40 Kg)	Repeatable	Separated SpO ₂ probe
2.3.08.00016	DB7 children fingertip SpO ₂ probe(1m)	Children(10~40 Kg)		
2.3.08.00017	DB7 adult fingerstall SpO ₂ probe(1m)	Adult(>40 Kg)		
2.3.08.00029	DB7 bundled SpO ₂ probe(1m)	Adult or children(> 10 Kg)		
2.3.09.00001	SpO ₂ probe extension cable(2m)		Repeatable	Separated extension cable

18.3 NIBP Accessories

Airway tube

Accessory No.	Accessory name	Description	Remark
2.3.11.00007	NIBP extension tube, gray TPU, both sides with quick connector(female)	Repeatable	/

Cuff

Accessory No.	Accessory name	Description	Remark
2.3.11.00001	Neonatal cuff, repeatable	Limb perimeter(6~11 cm)	/
2.3.11.00002	Infants cuff, repeatable	Limb perimeter(10~19 cm)	
2.3.11.00003	Children cuff, repeatable	Limb perimeter(18~26 cm)	
2.3.11.00004	Adult cuff, repeatable	Limb perimeter(25~35 cm)	
2.3.11.00005	Adult cuff, repeatable, large size	Limb perimeter(33~47 cm)	
2.3.11.00006	Leg cuff for adult, repeatable	Limb perimeter(46~66 cm)	

18.4 TEMP Accessories

TEMP probe

Accessory No.	Accessory name	Description	Remark
2.3.06.00001	Temperature probe($R_{25} = 2.252K$), body surface type, PVC, L=3 m	Repeatable	/
2.3.06.00002	Temperature probe($R_{25} = 2.252K$), body cavity type, PVC, L=3 m		
2.3.06.00017	Temperature probe($R_{25} = 2.252K$), body surface type, TPU, L=3 m		
2.3.06.00018	Temperature probe($R_{25} = 2.252K$), body cavity type, TPU, L=3 m		

Chapter 19 Default Settings

This appendix documents the most important default settings of your monitor as it is delivered from the factory. For a comprehensive list and explanation of default settings, see the Configuration Guide supplied with your monitor. The monitor's default settings can be permanently changed in Configuration Mode.

NOTE:

- If your monitor has been ordered preconfigured to your requirements, the settings at delivery will be different from those listed here.

19.1 Country-Specific Default Settings

Certain default settings are specific to a particular country. These are listed here for all countries alphabetically.

Country-Description	Line Frequency	Units Weight	Units Height	ECG Cable Color
	50/60 [Hz]	kg, lb	in, cm	IEC, AAMI
Afghanistan	50	kg	cm	AAMI
Åland Islands	50	kg	cm	IEC
Albania	50	kg	cm	IEC
Algeria	50	kg	cm	IEC
American Samoa	60	lb	in	AAMI
Andorra	60	lb	in	AAMI
Angola	50	kg	cm	IEC
Anguilla	60	lb	in	AAMI
Antarctica	60	lb	in	AAMI
Antigua and Barbuda	50	kg	cm	AAMI
Argentina	50	kg	cm	AAMI
Armenia	50	kg	cm	IEC
Aruba	60	kg	cm	AAMI
Australia	50	kg	cm	AAMI
Austria	50	kg	cm	IEC
Azerbaijan	50	kg	cm	IEC
Bahamas, The	60	kg	cm	AAMI
Bahrain	50	kg	cm	AAMI
Bangladesh	60	lb	in	AAMI
Barbados	50	kg	cm	AAMI
Belarus	50	kg	cm	IEC
Belgium	50	kg	cm	IEC
Belize	60	lb	in	AAMI
Benin	60	lb	in	AAMI
Bermuda	60	kg	cm	AAMI

Bhutan	60	lb	in	AAMI
Bolivia	50	kg	cm	AAMI
Bosnia and Herzegovina	50	kg	cm	IEC
Botswana	50	kg	cm	IEC
Bouvet Island	60	lb	in	AAMI
Brazil	60	kg	cm	AAMI
British Indian Ocean Territory	60	lb	in	AAMI
Brunei Darussalam	50	kg	cm	AAMI
Brunei	50	kg	cm	IEC
Bulgaria	50	kg	cm	IEC
Burkina Faso	50	kg	cm	IEC
Burundi	50	kg	cm	IEC
Cambodia	50	kg	cm	IEC
Cameroon	50	kg	cm	IEC
Canada	60	kg	cm	AAMI
Cape Verde	60	lb	in	AAMI
Cayman Islands	60	kg	cm	AAMI
Central African Republic	50	kg	cm	IEC
Chad	60	lb	in	AAMI
Chile	50	kg	cm	AAMI
China	50	kg	cm	IEC
Christmas Islands	60	lb	in	AAMI
Cocos Keeling Islands	60	lb	in	AAMI
Colombia	60	kg	cm	AAMI
Comoros	60	lb	in	AAMI
Congo	50	kg	cm	IEC
Congo, Democratic Republic of the	50	kg	cm	IEC
Cook Islands	60	lb	in	AAMI
Costa Rica	60	kg	cm	AAMI
Côte d'Ivoire	50	kg	cm	IEC
Croatia	50	kg	cm	IEC
Cuba	60	kg	cm	IEC
Cyprus	50	kg	cm	IEC
Czech Republic	50	kg	cm	IEC
Denmark	60	lb	in	AAMI
Djibouti	50	kg	cm	IEC
Dominica	50	kg	cm	AAMI
Dominican Republic	60	kg	cm	AAMI
Ecuador	60	kg	cm	AAMI

Egypt	50	kg	cm	IEC
El Salvador	60	kg	cm	AAMI
Equatorial Guinea	50	kg	cm	IEC
Eritrea	50	kg	cm	IEC
Estonia	50	kg	cm	IEC
Ethiopia	50	kg	cm	IEC
Falkland Islands, Malvinas	60	lb	in	AAMI
Faroe Islands	60	lb	in	AAMI
Fiji	60	lb	in	AAMI
Finland	50	kg	cm	IEC
France	50	kg	cm	IEC
French Guiana	50	kg	cm	IEC
French Polynesia	60	lb	in	AAMI
French Southern Territories	60	lb	in	AAMI
Gabon	50	kg	cm	IEC
Gambia, The	50	kg	cm	IEC
Georgia	60	lb	in	AAMI
Germany	50	kg	cm	IEC
Ghana	50	kg	cm	IEC
Gibraltar	60	lb	in	AAMI
Greece	50	kg	cm	IEC
Greenland	60	lb	in	AAMI
Grenada	50	kg	cm	AAMI
Guadeloupe	50	kg	cm	IEC
Guam	60	lb	in	AAMI
Guatemala	60	kg	cm	AAMI
Guernsey	50	kg	cm	IEC
Guinea	60	lb	in	AAMI
Guinea-Bissau	60	lb	in	AAMI
Guyana	60	kg	cm	AAMI
Haiti	60	kg	cm	AAMI
Heard Island and McDonald Islands	60	lb	in	AAMI
Holy See, Vatican City State	60	lb	in	AAMI
Honduras	60	kg	cm	AAMI
Hong Kong	50	kg	cm	IEC
Hungary	50	kg	cm	IEC
Iceland	50	kg	cm	IEC
India	50	kg	cm	IEC
Indonesia	50	kg	cm	IEC

Iran, Islamic Republic of	50	kg	cm	AAMI
Iraq	50	kg	cm	AAMI
Ireland	50	kg	cm	IEC
Isle of Man	50	kg	cm	IEC
Israel	50	kg	cm	IEC
Italy	50	kg	cm	IEC
Jamaica	50	kg	cm	AAMI
Japan	60	kg	cm	IEC
Jersey	50	kg	cm	IEC
Jordan	50	kg	cm	AAMI
Kazakhstan	50	kg	cm	IEC
Kenya	50	kg	cm	IEC
Kiribati	60	lb	in	AAMI
Korea, Democratic People's Republic of	60	lb	in	AAMI
Korea, Republic of	60	kg	cm	AAMI
Kuwait	50	kg	cm	AAMI
Kyrgyzstan	60	lb	in	AAMI
Lao People's Democratic Republics	50	kg	cm	IEC
Latvia	50	kg	cm	IEC
Lebanon	50	kg	cm	AAMI
Lesotho	50	kg	cm	IEC
Liberia	50	kg	cm	IEC
Libyan Arab. Jamahiriya	60	lb	in	AAMI
Liechtenstein	60	lb	in	AAMI
Lithuania	50	kg	cm	IEC
Luxembourg	50	kg	cm	IEC
Macao	60	lb	in	AAMI
Macedonia, The former Yugoslav. Rep. of	50	kg	cm	IEC
Madagascar	50	kg	cm	IEC
Malawi	50	kg	cm	IEC
Malaysia	50	kg	cm	IEC
Maldives	60	lb	in	AAMI
Mali	50	kg	cm	IEC
Malta	50	kg	cm	IEC
Marshall Islands	60	lb	in	AAMI
Martinique	60	kg	cm	IEC
Mauritania	50	kg	cm	IEC
Mauritius	60	lb	in	AAMI
Mayotte	60	lb	in	AAMI

Mexico	60	kg	cm	AAMI
Micronesia, Fed. States of	60	lb	in	AAMI
Moldova, Republic of	60	lb	in	AAMI
Monaco	60	lb	in	AAMI
Mongolia	60	lb	in	AAMI
Montenegro	50	kg	cm	IEC
Montserrat	50	kg	cm	AAMI
Morocco	50	kg	cm	IEC
Mozambique	50	kg	cm	IEC
Myanmar	60	lb	in	AAMI
Namibia	50	kg	cm	IEC
Nauru	60	lb	in	AAMI
Nepal	60	lb	in	AAMI
Netherlands	50	kg	cm	IEC
Netherlands Antilles	50	kg	cm	AAMI
New Caledonia	60	lb	in	AAMI
New Zealand	50	kg	cm	AAMI
Nicaragua	60	kg	in	AAMI
Niger	50	kg	cm	IEC
Nigeria	50	kg	cm	IEC
Niue	60	lb	in	AAMI
Norfolk Islands	60	lb	in	AAMI
Northern Mariana Islands	60	lb	in	AAMI
Norway	50	kg	cm	IEC
Oman	50	kg	cm	AAMI
Pakistan	50	kg	cm	IEC
Palau	60	lb	in	AAMI
Palestinian Territory	50	kg	cm	AAMI
Panama	60	lb	in	AAMI
Papua New Guinea	60	lb	in	AAMI
Paraguay	50	kg	cm	AAMI
Peru	60	kg	cm	AAMI
Philippines	60	kg	cm	AAMI
Pitcairn	60	lb	in	AAMI
Poland	50	kg	cm	IEC
Portugal	50	kg	cm	IEC
Puerto Rico	60	lb	in	AAMI
Qatar	50	kg	cm	AAMI
Reunion	60	lb	in	AAMI

Romania	50	kg	cm	IEC
Russian Federation	50	kg	cm	IEC
Rwanda	50	kg	cm	IEC
Saint Helena	60	lb	in	AAMI
Saint Kitts and Nevis	60	kg	cm	AAMI
Saint Lucia	50	kg	cm	AAMI
Saint Pierre and Miquelon	60	lb	in	AAMI
Saint Vincent and the Grenadines	50	kg	cm	AAMI
Samoa	60	lb	in	AAMI
San Marino	60	lb	in	AAMI
Sao Tome and Principe	60	lb	in	AAMI
Saudi Arabia	50	kg	cm	AAMI
Senegal	50	kg	cm	IEC
Serbia	50	kg	cm	IEC
Serbia & Montenegro	50	kg	cm	IEC
Seychelles	60	lb	in	AAMI
Sierra Leone	50	kg	cm	IEC
Singapore	50	kg	cm	IEC
Slovakia	50	kg	cm	IEC
Slovenia	50	kg	cm	IEC
Solomon Islands	60	lb	in	AAMI
Somalia	50	kg	cm	IEC
South Africa	50	kg	cm	IEC
South Georgia and the South Sandwich Islands	60	lb	in	AAMI
Spain	50	kg	cm	IEC
Sri Lanka	60	lb	in	AAMI
Sudan	50	kg	cm	IEC
Suriname	60	kg	cm	AAMI
Svalbard and Jan Mayen	60	lb	in	AAMI
Swaziland	60	lb	in	AAMI
Sweden	50	kg	cm	IEC
Switzerland	50	kg	cm	IEC
Syrian Arab Rep	50	kg	cm	AAMI
Taiwan, Province of China	60	kg	cm	AAMI
Tajikistan	60	lb	in	AAMI
Tanzania, United Republic of	60	lb	in	AAMI
Thailand	50	kg	cm	AAMI
Timor-Leste	60	lb	in	AAMI

Togo	60	lb	in	AAMI
Tokelau	60	lb	in	AAMI
Tonga	60	lb	in	AAMI
Trinidad and Tobago	60	lb	in	AAMI
Tunisia	50	kg	cm	IEC
Turkey	50	kg	cm	IEC
Turkmenistan	60	lb	in	AAMI
Turks and Caicos Islands	60	kg	cm	AAMI
Tuvalu	60	lb	in	AAMI
Uganda	60	lb	in	AAMI
Ukraine	60	lb	in	AAMI
UK	50	kg	cm	IEC
United Arab Emirates	50	kg	cm	AAMI
United Kingdom	50	kg	cm	IEC
United States	60	lb	in	AAMI
United States Minor Outlying Islands	60	lb	in	AAMI
Uruguay	50	kg	cm	AAMI
Uzbekistan	60	lb	in	AAMI
Vanuatu	60	lb	in	AAMI
Venezuela	60	lb	in	AAMI
Viet Nam	50	kg	cm	IEC
Virgin Islands (British)	50	kg	cm	AAMI
Virgin Islands (US)	60	lb	in	AAMI
Wallis and Futuna Islands	60	lb	in	AAMI
Western Sahara	50	kg	cm	IEC
Yemen	50	kg	cm	AAMI
Zambia	60	lb	in	AAMI
Zimbabwe	60	lb	in	AAMI

19.2 Alarm and Measurement Default Settings

Settings are only entered once per table row if they are the same for all patient categories.

19.2.1 Alarm

Name	Factory Default
ALM VOL	LOW
REC TIME	32 S
PAUSE_T	2 MIN
ALM TYPE	UNLATCH
KEY VOL	HIGH

Name	Factory Defaults		
	Adult	Pediatric	Neonatal
HR ALM	ON		
ALM LEV	MED		
ALM REC	OFF		
ALM HI	120 bpm	160 bpm	200 bpm
ALM LOW	50 bpm	75 bpm	100 bpm
HR CHANNEL	CH1		
TYPE	5 LEADS		
SPEED	25.0mm/s		

19.2.2 ECG

Arrhythmia analysis

Name	Factory Default		
	Adult	Pedi	Neo
ARR ANAL	OFF		
PVCS ALM	OFF		
LEV	MED		
REC	OFF		
HI	10		

ST-segment analysis

Name	Factory Default		
	Adult	Pedi	Neo
ST ANALYSE	OFF		
ST ALM	OFF		
ALM LEV	MED		
ALM REC	OFF		
ST1/ST2ALM HI	0.20		
ST1/ST2ALM LOW	-0.20		

19.2.3 RESP

Name	Factory Default		
	Adult	Pedi	Neo
ALARM	ON		
ALM LEV	MED		
ALM REC	OFF		
ALM HI	30 rpm		100 rpm
ALM LO	8 rpm		30 rpm

SPEED	25 mm/s		
APENA ALM	20 s		
WAVE AMP	X1		
RESP FROM	LL-RA		

19.2.4 SpO₂

Name	Factory Default		
	Adult	Pedi	Neo
ALARM	ON		
ALM LEV	Hi		
ALM REC	OFF		
ALM HIGH	100	100	95
ALM LOW	90	90	90
WAVE SWEEP	25 mm/s		
PR ALM	ON		
PR ALM HI	120 bpm	160 bpm	200 bpm
PR ALM LO	50 bpm	75 bpm	100 bpm

19.2.5 NIBP

Name	Factory Default		
	Adult	Pedi	Neo
ALARM	ON		
ALM LEV	MED		
ALM REC	OFF		
SYS HIGH	160 mmHg	120 mmHg	90 mmHg
SYS LOW	90 mmHg	70 mmHg	40 mmHg
MAP HI	110 mmHg	90 mmHg	70 mmHg
MAP LOW	60 mmHg	50 mmHg	25 mmHg
DIA HIGH	90 mmHg	70 mmHg	60 mmHg
DIA LOW	50 mmHg	40 mmHg	20 mmHg
UNIT	mmHg		
INTERVAL	MANUAL		
INFLATION	150 mmHg	100 mmHg	70 mmHg

19.2.6 TEMP

Name	Factory Default		
	Adult	Pedi	Neo
ALARM	ON		
ALM LEV	MED		
ALM REC	OFF		
TEMP HI	39.0		

TEMP LO	36.0
UNIT	°C

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Appendix A Product Specification

A.1 Classification

Anti-electroshock type	Class I, internal and external powered equipment
Anti-electroshock degree	Type CF defibrillation-proof applied part
Harmful liquid proof degree	IPX0
Working mode	Continuous working

A.2 Physical characteristic

Dimension(L×W×H)	Weight
191×160×244 mm	2.1 kg

A.3 Working environment

If used or stored outside the specified temperature and humidity range, the device may not meet the performance specifications listed here.

Working environment	
Temperature	+5~+40 °C
Humidity	15~85 %
Atmospheric pressure	700~1060 hPa
Storage environment	
Temperature	-40~+55 °C
Humidity	≤95% (non-condensating)
Atmospheric pressure	500~1060 hPa

A.4 Power supply

Input voltage	100-240 V ~
Frequency	50/60 Hz
Input power	±12W
Adapter Output	DC 9V 4,0A
Internal battery	
Battery type	Li-ion
Battery voltage	7,4 V
Battery capacity	2500 mAh
Minimum power supply time	120 min working conditions: use a new fully charged battery, ambient temperature: 25 °C. Device configuration: continuous measurement for ECG and SpO ₂ ; NIBP measurement in AUTO mode, measurement interval: 15 minutes
Charging time	0-90%: about 4 hours, fully charged: 5 hours

A.5 Display

Dimension(diagonal)	7" Color TFT
---------------------	--------------

Resolution	800*480
Display information	Up to 7-channel waveform

A.6 LED on host

Alarm indicator	One alarm indicator(yellow/red)
Battery indicator	One
AC power indicator	One

A.7 Recorder

Recorder type	Thermal dot-matrix
Waveform	2-channel
Recording width	48 mm
Paper length	20 m
Paper speed	25 mm/s-50 mm/s
Recording type	Continuous real-time recording 8-second real-time recording Auto 8-second recording Parameter alarm recording Waveform freeze recording Trend graph/table recording ARR events review recording Alarm event review recording NIBP review recording Drug calculation and titration table recording

A.8 Data storage

Trend recall	Short: 1 hour, resolution: 1 second Long: 480 hours, resolution: 1 minute
Alarm event recall	Physiological alarm: review for 72 alarm events of all parameters and 8/16/32-second of corresponding waveform.
Arrhythmia alarm event review	Review for 60 arrhythmia alarm events and 8-second of corresponding waveform.
NIBP measurement review	Review for the latest 4800 groups of NIBP data
SD card review	Trend data review: resolution: 1 minute 72-hour ECG waveform

A.9 ECG

Lead mode	3-lead: I, II, III 5-lead: I, II, III, aVR, aVL, aVF, V
Waveform	3-lead: 1-channel waveform 5-lead: 1-channel waveform, up to 7-channel waveform can be displayed on one display.
Lead style	AHA(American standard), IEC(European standard)
Sensitivity	2.5 mm/mV($\times 0.25$), 5 mm/mV($\times 0.5$), 10 mm/mV($\times 1$), 20 mm/mV($\times 2$)
Scan speed	12.5 mm/s, 25 mm/s, 50 mm/s
Frequency	Diagnosis: 0.05~75 Hz(+0.4 dB, -3 dB); 76~150 Hz(+0.4 dB, -4.5 dB)

response(bandwidth)	Monitoring: 0.67~40 Hz(+0.4 dB, -3 dB) Surgery: 1~20 Hz(+0.4 dB, -3 dB)	
CMRR	Monitoring: ≥ 100 dB Surgery: ≥ 100 dB Diagnosis: ≥ 90 dB	
Lead-off check	DC for active lead: $\leq 0.1 \mu\text{A}$ (Reference lead $\leq 1 \mu\text{A}$)	
Baseline recovery time	After defibrillation ≤ 5 s(under monitoring and surgery)	
Calibration signal	1 mV(peak-to-peak value), accuracy: ± 5 %	
Pacing pulse		
Pulse display	II lead	
Pulse indicator	Pulse is marked if the requirements of ANSI/AAMI EC13:2002, Sect. 4.1.4.1 are met: Amplitude: $\pm 2 \sim \pm 700$ mV Width: 0.1~2 ms Rise time: 10~100 μs	
Pulse Rejection	Pulse is rejected if the requirements of ANSI/AAMI EC13-2002; Sect. 4.1.4.1 are met: Amplitude: $\pm 2 \sim \pm 700$ mV Width: 0.1~2 ms Rise time: 10~100 μs	
Minimum input slew rate	4 V/s RTI	
Alarm limit	Range(bpm)	Step(bpm)
HR high limit	Adult: (low limit+1)~300 Pediatric and neonate: (low limit+1)~350	1
HR low limit	15~(high limit-1)	
HR		
Measurement limit	Adult: 15~300 bpm Pediatric and neonate: 15~350 bpm	
Accuracy	± 2 % or ± 2 bpm, whichever is greater	
Resolution	1 bpm	
Alarm accuracy	± 2 bpm	
Maximum suppression ability for T wave	1.2 mV	
HR mean	In the RR interval within the latest 6 seconds, take the average value after removing the maximum and minimum values. The heart rate displayed on the screen is refreshed in every second.	
Response time for heart rate meter to HR change	80 to 120 bpm: < 8 s 80 to 40 bpm: < 8 s	
Heart rate meter accuracy and response to irregular rhythm	After stable phase(20s), the HR values are: Bigeminy ventricular: 80 bpm ± 1 bpm Bigeminy ventricular alternative lente: 60 bpm ± 1 bpm Bigeminy ventricular alternative rapid: 120 bpm ± 1 bpm Systoles bidirectional: 95 bpm ± 1 bpm	
Time to ALARM for tachycardia		
Tachycardia ventricular: amplitude =1 mV(p-v), heart rate =206 bpm	Gain 1.0: 8 s	
	Gain 0.5: 8 s	

	Gain 2.0: 8 s
Tachycardia ventricular : amplitude =2 mV(p-v), heart rate =195 bpm	Gain 1.0: 8 s
	Gain 0.5: 8 s
	Gain 2.0: 8 s
Arrhythmia type	ASYSTOLE, BIGEMINY, VFIB/VTAC, TRIGEMINY, PVC, R ON T, COUPLET, MISSED BEATS, VT>2, PNC, TACHY, PNP, BRADY
ST-segment measurement	
Measurement range	-2.0 mV~+2.0 mV
Accuracy	-0.8 mV~+0.8 mV: ± 0.04 mV or $\pm 10\%$, whichever is greater. Other range: unspecified

A.10 RESP

Measurement method	Impedance	
Waveform gain	2.5 mm/mV($\times 0.25$), 5 mm/mV($\times 0.5$), 10 mm/mV($\times 1$), 20 mm/mV($\times 2$), 40 mm/mv($\times 4$)	
Measurement impedance range	0.3~5 Ω	
Base line impedance range	500~2500 Ω	
Differential input impedance	>2.5 M Ω	
Bandwidth	0.2~2.5 Hz	
Scan speed	12.5 mm/s, 25 mm/s	
RR		
Measurement range	0~150 rpm	
Resolution	1 rpm	
Accuracy	7~150 rpm; ± 2 rpm 0~6 rpm; undefined	
Apnea alarm	10~40 s	
Alarm limit	range(rpm)	Step(rpm)
Alarm high limit	(low limit+1)~150	1
Alarm low limit	Adult: 0~(high limit-1) Pediatric and neonate: 0~(high limit-1)	

A.11 NIBP

Measurement method	Oscillometric			
Working mode	Manual, Auto, STAT			
Measurement Interval in AUTO Mode	1, 2, 3, 4, 5, 10, 15, 30, 60, 90, 120, 180, 240, 480 min			
Measuring Period in STAT Mode	5 min			
Measurement parameters	SYS, DIA, MEAN			
NIBP measurement		Adult	Pediatric	Neonatal

range(mmHg)	Systolic pressure	40~270	40~235	40~135
	Diastolic pressure	10~215	10~195	10~100
	Mean pressure	20~235	20~210	20~110
Accuracy	Maximum mean error: ± 5 mmHg Maximum Standard deviation: 8 mmHg			
Pressure resolution	1 mmHg			
Cuff pressure accuracy	± 3 mmHg			
Over-pressure protection	Adult: 297 mmHg ± 3 mmHg Pediatric: 240 mmHg ± 3 mmHg Neonate: 147 mmHg ± 3 mmHg			
Alarm limit	Range(mmHg)	Step(mmHg)		
High limit of systolic pressure	Adult: (low limit+1)~270 Pediatric: (low limit+1)~200 Neonate: (low limit+1)~135	1		
Low limit of systolic pressure	40~(high limit-1)	1		
High limit of diastolic pressure	Adult: (low limit+1)~215 Pediatric: (low limit+1)~195 Neonate: (low limit+1)~100	1		
Low limit of diastolic pressure	10~(high limit-1)	1		
High limit of mean pressure	Adult: (low limit+1)~235 Pediatric: (low limit+1)~210 Neonate: (low limit+1)~110	1		
Low limit of mean pressure	20~(high limit-1)	1		

A.12 SpO₂

Measurement and display range	0~100 %		
Resolution	1 %		
Accuracy	70~100 %: ± 2 %; 0~69 %: unspecified;		
Updating cycle	About 1 s		
Mean time	4 s,8 s,16 s		
Alarm limit	Range(%)	Step(%)	
SpO ₂ high limit	(low limit+1)~100	1	
SpO ₂ low limit	0~(high limit-1)		
PR			
Measurement and display	25~250 bpm		
Resolution	1 bpm		
Accuracy	± 3 bpm or $\pm 3\%$, whichever is greater		

Updating cycle	1 s	
Alarm limit	Range(bpm)	Step(bpm)
PR high limit	(low limit+1)~250	1
PR low limit	25~(high limit-1)	

Note: Since the Sp02 measurement is only distributed at statistical probability, only about 2/3 of the measurement value falls within the accuracy (Arms) measured by the CO-oximetery.

A.13 TEMP

Measurement method	Thermistor method	
Channel	1-channel	
Probe type	YSI-2.252 K	
Measurement site	Body surface probe: armpit Body cavity probe: oral, rectum	
Measurement range	0~50 °C	
Resolution	0.1 °C	
Accuracy	±0.1 °C	
Updating cycle	About 1 s	
Response mean time	<10 s	
Alarm response time	\leq 2 min	
Unit	°C or °F	
Alarm limit	Range(°C)	Step(°C)
TMEP high limit	(low limit +1)~50	1
TMEP low limit	0~(high limit-1)	

Appendix B System Alarm Prompt

PROMPT	CAUSE	MEASURE
"XX TOO HIGH"	XX value exceeds the higher alarm limit.	Check if the alarm limits are appropriate and the current situation of the patient.
"XX TOO LOW"	XX value is below the lower alarm limit.	
XX represents the value of parameter such as HR, ST, RR, SpO ₂ , NIBP, etc in the system.		
"ECG WEAK SIGNAL"	The ECG signal of the patient is too small so that the system can not perform ECG analysis.	Check if the electrodes and lead wires are connected correctly and the current situation of the patient.
"NO PULSE"	The pulse signal of the patient is too small so that the system can not perform pulse analysis.	Check the connection of the sensor and the current situation of the patient.
"RESP APNEA"	The respiration signal of the patient is too small so that the system cannot perform RESP analysis.	Check the connection of the linking wire and the current situation of the patient.
"ASYSTOLE"	Patient suffers from Arr. Of ASYSTOLE.	Check the current situation of the patient. Check the connection of the electrodes and lead wires.
"VFIB/VTAC"	Patient suffers from Arr. of VFIB/VTAC.	Check the current situation of the patient. Check the connection of the electrodes and lead wires.
"COUPLET"	Patient suffers from Arr. of COUPLE.	Check the current situation of the patient. Check the connection of the electrodes and lead wires.
"BIGEMINY"	Patient suffers from Arr. Of BIGEMINY.	Check the current situation of the patient. Check the connection of the electrodes and lead wires.
"TRIGEMINY"	Patient suffers from Arr. of TRIGEMINY.	Check the current situation of the patient. Check the connection of the electrodes and lead wires.
"R ON T"	Patient suffers from Arr. of R ON T.	Check the current situation of the patient. Check the connection of the electrodes and lead wires.
"PVC"	Patient suffers from Arr. of PVC.	Check the current situation of the patient. Check the connection of the electrodes and lead wires.

"TACHY"	Patient suffers from TACHY.	Check the current situation of the patient. Check the connection of the electrodes and lead wires.
" BRADY"	Patient suffers from BRADY.	Check the current situation of the patient. Check the connection of the electrodes and lead wires.
"VT>2"	Patient suffers from Arr. of VT>2.	Check the current situation of the patient. Check the connection of the electrodes and lead wires.
"MISSED BEATS"	Patient suffers from Arr. of MISSED BEATS.	Check the current situation of the patient. Check the connection of the electrodes and lead wires.
"PNP"	The pacemaker is not paced.	Check the connection of the pacemaker. Check the connection of electrodes and lead wires. Check the current situation of the patient.
"PNC"	No pacemaker signal is captured.	Check the connection of the pacemaker. Check the connection of electrodes and lead wires. Check the current situation of the patient.
"ECG LEAD OFF"	ECG lead is not connected correctly.	Check the connection of ECG lead wire.
"ECG V LEAD OFF"	The V lead wire of ECG is not connected correctly.	Check the connection of V lead wire.
"ECG LL LEAD OFF"	The LL lead wire of ECG is not connected correctly.	Check the connection of LL lead wire.
"ECG LA LEAD OFF"	The LA lead wire of ECG is not connected correctly.	Check the connection of LA lead wire.
"ECG RA LEAD OFF"	The RA lead wire of ECG is not connected correctly.	Check the connection of RA lead wire.
"ECG C LEAD OFF"	The C lead wire of ECG is not connected correctly.	Check the connection of C lead wire.
"ECG F LEAD OFF"	The F lead wire of ECG is not connected correctly.	Check the connection of F lead wire.
"ECG L LEAD OFF"	The L lead wire of ECG is not connected correctly.	Check the connection of L lead wire.
"ECG R LEAD OFF"	The R lead wire of ECG is not	Check the connection of R lead wire.

	connected correctly.	
"SpO ₂ SENSOR OFF"	SpO ₂ sensor may be disconnected from the patient or the monitor.	Make sure that the monitor and the patient are in correct connection with the cables.
"SpO ₂ INIT ERR"	SpO ₂ module failure	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
"SpO ₂ INIT ERR 1"		
"SpO ₂ INIT ERR 2"		
"SpO ₂ INIT ERR 3"		
"SpO ₂ INIT ERR 4"		
"SpO ₂ INIT ERR 5"		
"SpO ₂ INIT ERR 6"		
"SpO ₂ INIT ERR 7"		
"SpO ₂ INIT ERR 8"		
"SpO ₂ COMM STOP"	SpO ₂ module failure or communication error	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
"SpO ₂ COMM ERR"	SpO ₂ module failure or communication error	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
"SpO ₂ ALM LMT ERR"	Functional safety failure	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
"PR ALM LMT ERR"	Functional safety failure	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
Alarm information:		
"SpO ₂ NO SENSOR"	Sensor not fully inserted into the connector.	May be an incorrect sensor, or a defective sensor or cable. Insert sensor into the connector. Disconnect and reconnect sensor. Refer to the instructions for the sensor being used.
	Sensor inserted upside down.	Disconnect and reconnect the sensor with the logos matching.
"SpO ₂ SENSOR OFF"	SpO ₂ sensor may be disconnected from the patient or the monitor.	Disconnect and reconnect the sensor. Reattach sensor.
"SpO ₂ SENSOR FAULT"	This message appears when the sensor is faulty	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
"SpO ₂ UNRECOGNIZED SENSOR"	board does not recognize the sensor.	Make sure that the monitor and the patient are in correct connection with the cables.
"SpO ₂ INCOMPATIBLE SENSOR"	This message is displayed when the sensor is finding incompatible sensor.	Make sure that the monitor use incompatible sensor.

"SpO ₂ INTERFERENCE"	Outside signal or energy preventing reading.	Remove outside interference.
"SpO ₂ PULSE SEARCH"	Unit is searching for the patients pulse.	If values are not displayed within 30 seconds, disconnect and reconnect sensor. If pulse search continues, remove sensor and replace on a better perfused site.
"SpO ₂ LOW PERFUSION"	Signal too small.	Move sensor to better perfused site.
"SpO ₂ TOO MUCH LIGHT"	Too much light on patient(sensor). Inadequate tissue covering sensor detector.	Remove or reduce lighting. Cover sensor from light. Reposition sensor.
"SpO ₂ LOW SIGNAL IQ"	Low signal quality.	Ensure proper sensor application. Move sensor to a better perfused site.
"SpO ₂ BOARD FAULT"	This message appears when the Set board malfunctions.	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
"SpO ₂ COMMUNICATION ERROR"	This message is displayed when the front end module is having problems communicating (ie: framing errors or bad checksums) with the board.	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
"SpO ₂ COMMUNICATION STOP"	This message is displayed when the host can not receive the data from board for 5 seconds	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
"SpO ₂ INIT ERR"	This message is displayed when the SpO ₂ module initialization error happened.	Stop using the measuring function of SpO ₂ module, notify biomedical engineer or our service staff.
"TEMP SENSOR OFF"	TEMP sensor is not connected correctly.	Check the connection of TEMP sensor.
"ECG NOISE"	Rather large interference signals appear in the ECG signals.	Check the connection of ECG lead wire. Check the current situation of the patient. Check if the patient moves a lot.
"XX INIT ERR X"	XX has error X during initialization.	Re-start up the monitor or re-plug in/out the module. If the error still exists, contact the manufacturer.
"XX COMM STOP"	XX cannot communicate with the host.	
"XX COMM ERR"	XX cannot communicate normally with the host.	
XX represents all the parameter modules in the system such as ECG, NIBP, SpO ₂ , module, etc.		

"XX ALM LMT ERR"	The alarm limit of XX parameter is modified by chance.	Contact the manufacturer for repair.
"XX RANGE EXCEEDED"	The measured value of XX parameter has exceeded the measuring range of the system.	Contact the manufacturer for repair.
XX represents the parameter name in the system such as HR, ST, RR, SpO ₂ , NIBP, etc.		
"REAL CLOCK NEEDSET"	When the system displays 2000-1-1, the system gives this prompt reminding the user that the current system time is not right.	Re-set up the system time. It is better to set up the time just after the start-up and prior to monitoring the patient. After modifying the time, the user had better re-start up the monitor to avoid storing error time.
"REAL CLOCK NOT EXIST"	The system has no cell battery or the battery has run out of the capacity.	Install or replace the rechargeable battery.
"SYSTEM WD FAILURE"	The system has serious error.	Re-start up the system. If the failure still exists, contact the manufacturer.
"SYSTEM SOFTWARE ERR"		
"SYSTEM CMOS FULL"		
"SYSTEM CMOS ERR"		
"SYSTEM EPGA FAILURE"		
"SYSTEM FAILURE2"		
"SYSTEM FAILURE3"		
"SYSTEM FAILURE4"		
"SYSTEM FAILURE5"		
"SYSTEM FAILURE6"		
"SYSTEM FAILURE7"		
"SYSTEM FAILURE8"		
"SYSTEM FAILURE9"		
"SYSTEM FAILURE10"		
"SYSTEM FAILURE11"		
"SYSTEM FAILURE12"		
"KEYBOARD NOT AVAILABLE"	The keys on the keyboard cannot be used.	Check the keys to see whether it is pressed manually or by other object. If the key is not pressed abnormally, contact the manufacturer for repair.
"KEYBOARD COMM ERR"	The keyboard has failure, which cannot be used.	Contact the manufacturer for repair.
"KEYBOARD ERROR"		

"KEYBOARD ERR1"		
"KEYBOARD ERR2"		
"NET INIT ERR(G.)"		
"NET INIT ERR(Ram)"		
"NET INIT ERR(Reg)"		
"NET INIT ERR(Mii)"		
"NET INIT ERR(Loop)"		
"NET ERR(Run1)"		
"NET ERR(Run2)"		
"NET ERR(Run3)"		
"5V TOO HIGH"		
"5V TOO LOW"		
"POWER ERR3"		
"POWER ERR4"		
"12V TOO HIGH"		
"12V TOO LOW"		
"POWER ERR7"		
"POWER ERR8"		
"3.3V TOO HIGH"		
"3.3V TOO LOW"		
"CELL BAT TOO HIGH"	Cell battery has problem.	
"CELL BAT TOO LOW"	The cell battery has low capacity or the cell battery is not installed or the connection is loose.	Replace the battery. If the failure still exists, contact the manufacturer.
"NIBP INIT ERR"	NIBP initialization error	Execute the reset program in the NIBP menu. If the failure still exists, contact the manufacturer for repair.
"NIBP SELFTEST ERR"		
"NIBP ILLEGALLY RESET"	During NIBP measurement, illegal reset occurs.	Check the airway of NIBP to see if there are clogs. Then measure again, if the failure still exists, contact the manufacturer for repair.
"NIBP COMM ERR"	The NIBP communication part has problem.	Execute the reset program in the NIBP menu. If the failure still exists, contact the manufacturer for repair.
"LOOSE CUFF"	The NIBP cuff is not connected correctly.	Re-connect the NIBP cuff.

"AIR LEAK"	The NIBP cuff is not connected correctly or there are leaks in the airway.	Check the connection of each part or replace with a new cuff. If the failure still exists, contact the manufacturer for repair.
"AIR PRESSURE ERROR"	Problem happens when measuring the curve. The system cannot perform measurement, analysis or calculation.	Check the connection of each part or replace with a new cuff. If the failure still exists, contact the manufacturer for repair.
"WEAK SIGNAL"	Problem happens when measuring the curve. The system cannot perform measurement, analysis or calculation.	Check if the setup of patient type is correct. Check the connection of each part or replace with a new cuff. If the failure still exists, contact the manufacturer for repair
"RANGE EXCEEDED"	Problem happens when measuring the curve. The system cannot perform measurement, analysis or calculation.	Check the connection of each part or replace with a new cuff. If the failure still exists, contact the manufacturer for repair.
"EXCESSIVE MOTION"	The patient arm moves.	Check the connection of each part and the patient situation. Measure again, if the failure still exists, contact the manufacturer for repair.
"OVER PRESSURE"	Perhaps folds exist in the airway.	Check for the smoothness in the airway and patient situation. Measure again, if the failure still exists, contact the manufacturer for repair.
"SIGNAL SATURATED"	Problem happens when measuring the curve. The system cannot perform measurement, analysis or calculation.	Check the connection of each part and the patient situation. Measure again, if the failure still exists, contact the manufacturer for repair.
"NIBP TIME OUT"	Problem happens when measuring the curve. The system cannot perform measurement, analysis or calculation.	Check the connection of each part and the patient situation. Measure again, if the failure still exists, contact the manufacturer for repair.
"CUFF TYPE ERR"	Perhaps the used cuff does not fit the setup patient type.	Check if the patient type is set up correctly. Check the connection of each part or replace with a new cuff. If the failure still exists, contact the manufacturer for repair.

"PNEUMATIC LEAK"	NIBP airway has leaks.	Check the connection of each part or replace with a new cuff. If the failure still exists, contact the manufacturer for repair.
"MEASURE FAIL"	Problem happens when measuring the curve. The system cannot perform measurement, analysis or calculation.	Check the connection of each part and the patient situation. Measure again, if the failure still exists, contact the manufacturer for repair.
"NIBP SYSTEM FAILURE"	Problem happens when measuring the curve. The system cannot perform measurement, analysis or calculation.	Check the connection of each part and the patient situation. Measure again, if the failure still exists, contact the manufacturer for repair.

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Appendix C Abbreviations

E.1 Unit list

Abbreviation	Description
μA	microampere
μV	microvolt
A	ampere
Ah	ampere hour
bpm	beat per minute
$^{\circ}\text{C}$	centigrade
cm	centimeter
dB	decibel
$^{\circ}\text{F}$	fahrenheit
g	gram
h	hour
Hz	hertz
inch	inch
k	kilo
kg	kilogram
kPa	kilopascal
L	litre
lb	pound
m	meter
mAh	milliampere hour
mcg	microgram
mEq	milli-equivalents
mg	milligram
min	minute
ml	milliliter
mm	millimeter
mmHg	millimeters of mercury
cmH ₂ O	centimeters of water
ms	millisecond
mV	millivolt
mW	milliwatt
M Ω	megaohm
nm	nanometer
rpm	breaths per minute
s	second
V	volt

VA	volt ampere
Ω	ohm
W	watt

E.2 Terminology list

Abbreviation	Description
AC	alternating current
Adu	adult
AHA	American Heart Association
Art	arterial
aVF	left foot augmented lead
aVL	left arm augmented lead
aVR	right arm augmented lead
AwRR	airway respiratory rate
BP	blood pressure
CO	cardiac output
CCU	cardiac (coronary) care unit
CI	cardiac index
CISPR	International Special Committee on Radio Interference
CMS	central monitoring system
CO ₂	carbon dioxide
COHb	carboxyhemoglobin
CVP	central venous pressure
DC	direct current
Dia	diastolic
DPI	dot per inch
ECG	electrocardiograph
EMC	electromagnetic compatibility
EMI	electromagnetic interference
ESD	electro-static discharge
ESU	electrosurgical unit
Et	end-tidal
EtCO ₂	end-tidal carbon dioxide
EtO	ethylene oxide
HR	heart rate
ICG	Impedance cardiography
ICT/B	intracranial catheter tip pressure transducer
ICU	intensive care unit
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers

IBP	Invasive brood pressure
IP	internet protocol
LA	left arm
LAP	left atrial pressure
LCD	liquid crystal display
LED	light emitting diode
LL	left leg(electrode)
MAP	mean arterial pressure
MetHb	methemoglobin
MRI	magnetic resonance imaging
N/A	not applied
Neo	neonate
NIBP	noninvasive blood pressure
oxyCRG	oxygen cardio-respirogram
Ped	pediatric
Pleth	plethysmogram
PR	pulse rate
PVC	premature ventricular contraction
RA	right arm
Rec	record, recording
Resp	respiration
RL	right leg(electrode)
RR	respiration rate
SpO ₂	arterial oxygen saturation from pulse oximetry
SV	stroke volume
SYS	systolic pressure
TBW	Total body water
TD	temperature difference
TPR	total peripheral resistance
Temp	temperature
USB	universal serial bus



PT. SINKO PRIMA ALLOY

Alamat	: Jl. Tambak Osowilangun Permai No. 61, Pergudangan Osowilangun Permai Blok E7-E8, Surabaya-Indonesia (60191)
Telepon	: 031-7482816
Fax.	: 031-7482815
Aftersale (WA)	: 0821-4281-7085
Email	: sinkoprime@gmail.com
Website	: www.ciptajayamedika.com

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